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Climatological Data at the Proposed Prototype Sites in the United States for the Evaluation of HUD Operation BREAKTHROUGH Housing Systems

T. Kusuda

Center for Building Technology
Institute for Applied Technology
National Bureau of Standards
Washington, D. C. 20234

April 10, 1973

Final Report

Prepared for
Office of Research and Technology
Department of Housing and Urban Development
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U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary

NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

The following team was appointed on January 26, 1970, by Dr. J. R. Wright, Chief, Building Research Division to prepare this report.

T. Kusuda, Chairman, Environmental Engineering Section - heating and cooling design data.

H. C. S. Thom, ESSA - weather parameters.

D. R. Flynn and G. E. Winzer, Sensory Environment Branch - background noise levels.

B. C. Cadoff, Environmental Engineering Section and D. H. Fair, NAPCA, Cincinnati - air contamination.

R. D. Marshall, Structures Section - wind and earthquake data.

Review: F. J. Powell, Chief, Environmental Engineering Section.

P. R. Achenbach, Chief, Sensory Environment Branch.

E. O. Pfrang, NBS-HUD Breakthrough Program Manager.

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Introduction

The purpose of this report is to provide preliminary information on site climatology useful for the design and evaluation of HUD Operation Breakthrough prototype building systems. In order to evaluate the design as well as the performance of building systems, the following environmental parameters are considered essential.

Temperature
Humidity
Wind speed and direction
Precipitation (snow and rain)
Solar radiation (direct and diffuse)
Ground temperature (depth of frost)
Background noise level
Air contamination
Earthquake risk

Climatological data for Breakthrough sites that pertain to the above parameters are scattered throughout the scientific literature. The bulk of the information presented, however, comes from the publications of the Environmental Science Services Administration (ESSA). The charge to the task group for this particular undertaking was to rapidly assemble all available climatological data pertaining to the above parameters for the Breakthrough localities, which actually contain the proposed building sites.

1. Sacramento, California (suburban site)
2. Wilmington, Delaware (suburban site)
3. Macon, Georgia (suburban site)
4. Indianapolis, Indiana (city perimeter site)
5. Kalamazoo, Michigan (suburban site)
6. St. Louis, Missouri (inner-city site)
7. Jersey City, New Jersey (inner-city site)
8. Memphis, Tennessee (inner-city site)
9. Houston, Texas (suburban site)
10. Seattle, Washington (suburban and inner-city sites)

Except for a few localities, most of the weather data reported in the literature are recorded at airport weather stations. This fact, however, is not too critical for the evaluation of Breakthrough building systems located in the suburbs. For the inner-city sites, most of the weather data recorded at the weather bureau city office should be appropriate. Only the city office data for St. Louis and Seattle are available, however, for the in-city sites listed above. Data for the Jersey City and Memphis sites are, therefore, to be corrected from those obtained at the airport weather stations*/. City maps shown in the Appendix indicate relative locations of Breakthrough prototype sites with respect to the downtown area and to the airports. These maps should be useful in evaluating the correction factors for the airport weather data as well as the background noise and air contamination of the prototype sites.

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*/ The corrections were made in accordance with the recommendations made by H. C. S. Thom of the Environmental Science Service Administration.

Climatological data required for the design of safe building systems are usually the extreme values of parameters such as the highest recorded wind velocity, the deepest snow fall, earthquake data and temperature extremes. The building systems are expected to resist these natural forces and to provide protection for the occupants. On the other hand, the data required for the evaluation of the building performance over a period of time are those data associated with the frequency and the sequential nature of occurrences. This latter type of data are used to predict the comfort of the occupants, energy requirements for heating and cooling the building, and weatherability of building materials. Data compiled herein are, therefore, assembled with a view toward fulfilling the need for two requirements: one for the design evaluation and a second for the performance evaluation.

It is most unusual in the planning of buildings and similar engineering structures to have sufficient meteorological data available at the site which can be used directly for design purposes. Regarding wind data, for example, it is usually necessary to make use of detailed records obtained at the nearest Weather Bureau Station. Because of changes in terrain, a conversion may be required. This conversion can take the form of a regression equation which requires that extensive (approximately 4 years) simultaneous records be established for the station and for the site; or the conversion may be based upon an evaluation of the terrain roughness and on assumptions concerning the nature of the atmospheric boundary layer. It is believed that the latter approach is the only reasonable one here because of the limited

According to the 1967 ASHRAE Handbook of Fundamentals the Sol-air temperatures (SAT) are calculated by the following formula:

$$SAT = \frac{\alpha I}{h} + DB - 7a \qquad (1)$$

where α, I, h and DB represent surface absorptivity of the solar radiation, solar radiation per unit surface, surface heat transfer coefficient and outdoor air dry-bulb temperature, respectively. The negative term, -7a, represents the long wavelength radiation of the building surface with respect to the sky. The direction cosine, "a", of the surface is unity for a roof surface and zero for a vertical wall surface. Theoretically, the Sol-air temperature can be considered to be the maximum surface temperature when there is no heat conducted from the exterior surface of the building to the interior surface. Surface temperatures become very high when the surface is a perfect absorber (e.g., black-colored surface with a value of α near unity), when the wind speed is low (very small value of h), when the Zenith angle is small in a cloudless sky (a larger value of I) and when the coincident air temperature (DB) is also high.

The ASHRAE cooling load calculation procedure requires the use of Sol-air temperature profiles. Profiles for a variety of locations are not published in the 1967 ASHRAE Handbook of Fundamentals, nor are they available from other literature sources. Each geographic location must be separately calculated. This may be one of the reasons that some engineers still prefer to use simplified or short-cut cooling load calculation methods, similar to those used for the heating load. Since many of the Breakthrough building systems may be different in design from conventional buildings (for which most of the simplified or short-cut methods have been developed in the past), it is recommended that the ASHRAE cooling load calculation be followed rigorously. Upon this premise, Sol-air temperature profiles for the ten cities have, therefore, been developed for this report. The values for solar radiation for a cloudless sky for July 21 were first calculated using the same procedure described in the 1967 ASHRAE Book of Fundamentals. These are given in Table B (pp. 28-39) for all eleven sites. Since it is also required to have the design day dry-bulb temperature profiles, these were also developed on the assumption that the dry-bulb temperature follows a simple harmonic profile in a manner to achieve a maximum value of 1% ASHRAE at 1600 hours and a minimum value of 500 hours. The minimum value was calculated by subtracting the daily range value listed in the ASHRAE weather data table from the 1% data.

The profile thus synthesized for Houston, Texas, for example, compares well with the ten year mean daily profile representing the hottest days of each year, as shown in Figure 1[4/]. Similarly good comparisons were obtained for five other cities, Phoenix, (Ariz.), Washington, (D. C.), Lake Charles, (La.), Minneapolis, (Minn.), and Medford, (Oreg.) as shown in a dimensionless scheme of Fig. 2. Although, except for Houston, Texas, these six cities are not the HUD Operation Breakthrough sites, it is believed that the dimensionless relationship verified by these cities should be equally valid for the Breakthrough sites.

The values of 0.15 and 0.3 were used for α/h of eq. (1) to be consistent with the sample Sol-air temperature tables illustrated in the Handbook of Fundamentals[1/]. Table C (pp. 40-62) shows the Sol-air temperature profiles developed for the ten cities of Breakthrough building sites.

B. Data for Energy Estimates

Accurate estimation of heating and cooling energy requirements is important for evaluating the Breakthrough building systems. This is particularly important because of the many varieties of heating and cooling systems available today which depend upon different energy sources, types of heating and cooling processes, and types of energy distribution systems. Thus, a difference in energy requirements between systems may become a significant factor in the selection of a system. The energy calculation, therefore, should utilize the most precise and reliable up-to-date procedures. The most accurate procedures available are based upon a computer simulation of the hour by hour operation of the heating and cooling system as it responds to the dynamic thermal behavior of the building. This calculation procedure requires coincident hourly observations of most of the parameters mentioned above for a period of at least one year, when the annual energy usage is of primary concern. Such hourly data are available on magnetic tapes from the National Climatic Center, Ashville, North Carolina. The list of tape reel numbers for ten Breakthrough localities is given in Table D (p. 63).

Although several computer programs are currently available to perform this comprehensive hourly analysis for the energy requirements, the cost for such a calculation may not be warranted in some cases, particularly during early planning stages.

In lieu of the hourly calculation method because of time, cost, availability, and accuracy requirement factors, three simplified methods such as the degree-day method, equivalent full-load hour method, or the "bin" method may be selected. The degree-day concept was designed for residential applications based upon average conditions experienced by several hundred homes in the Northern United States. The seasonal total of the degree days based upon the reference temperature of 65 °F for heating and cooling are given in Table A (p. 27), although the degree-day data for the cooling energy estimate have not been as widely accepted as that for the heating. The second method commonly used for estimating cooling energy requirements has been the equivalent full-load hour method. For this method the energy consumption for each of several buildings of a given type is measured and expressed as the number of hours of operation at full load which would produce the same energy consumption. These figures are then averaged to arrive at the equivalent full-load hours for a given type of building in a given climatic region. Annual cooling energy requirements are then estimated for a specific building by multiplying the peak cooling load by the equivalent load hours. The equivalent full-load hour data for conventional buildings for the ten Breakthrough localities selected are not available. A third technique which has been gaining acceptance is application of the "bin" method. Each temperature "bin" contains hourly frequency of occurrence of temperature specified for the range of the "bin" (usually in 5 °F increments). Heat gain or heat loss of the building is calculated and expressed as a function of ambient dry-bulb temperature (not necessarily a linear function). The total energy requirements are then calculated from the sum of the product of the heat load and the frequency of the "bin". By making the width of the temperature "bin" smaller, the accuracy of the energy estimate obtained by this method can be increased. For the benefit of engineers who might want to use the "bin" method, "bin" data from Air Force Manual (AFM) 88-8 for the ten Breakthrough localities ... are shown in Table E (pp. 64-84). A detailed account of the use of the "bin" method is given in reference (5).

C. Solar Radiation

Table A (p. 26) shows the maximum daily total solar radiation upon a horizontal surface; it was calculated for the cloudless day of July 21 using the method described in reference (1). The average percent of probable sunshine for the months of July and January may be important for the design of lighting and this data is obtained from reference (11).

More detailed data for the solar radiation levels are given in Table B (pp. 28-39).

D. Coincident Wind Velocity for the Heating and Cooling Load Calculation

Coincident wind velocity designated as VL, L, M and H in Table A (p. 25) as associated with the temperature data refers to the following classification[2/]:

VL: Very light where 70%[*/] or more of the cold extreme hours are coincident with wind speeds less than or equal to 7 mph

L: Light, 50 to 69 percent of cold extreme hours are less than or equal to 7 mph wind speed

M: Moderate, where 50 to 74 percent cold extreme hours are coincident with wind speeds of more than 7 mph

H: High, where 75 percent or more of the cold extreme hours are coincident with wind speeds of 7 mph and 50 percent of the cold extreme hours are coincident with wind speeds of more than 12 mph.

[*/] The percentage figures used in this section refer to the percentage of the number of winter hours.

Figures 3 through 22 show pictorially the annual frequency of the occurrences of coincident wind speeds and dry-bulb temperatures and relative humidities for the ten Breakthrough localities while Figures 23 through 32 indicate the summer and winter coincident wind speed profiles with respect to the wind direction.

E. Ground Temperature

Ground temperature data are needed for calculations to the estimate heat gained or lost from the basement floors and walls. These data are also needed for the design of underground heat distribution systems and to evaluate the probabilities for a freeze-up of water mains and sewage disposal lines. It should be noted that underground temperature at depths greater than 30 ft remain relatively unchanged throughout the year at the annual average air temperatures listed in Table A (p. 25). The well-water temperature is also equal to the annual average air temperature. However, most underground installations require heat transfer calculations because they are usually installed at depths less than 10 ft from the surface. Listed in Table A are the integrated average earth temperatures from the surface to the ten foot depth for summer and winter conditions. These values are derived by a method similar to that described in reference (7) assuming the thermal diffusivity of soil to be 0.025 ft^2/hr. Unless the soil is extremely dry or unless there are strong underground heat sources nearby, data shown in Table A should be a good approximation of the undisturbed soil temperature for the evaluation of underground installations. The freezing depth indicated in Table A (p. 25) was approximated from the earth temperature data compiled in reference (7).

F. Background Noise Data

The following qualitative estimates of ambient noise levels at the various Breakthrough sites were made by inspection of maps (Appendix) showing locations of nearby highways, airports, or other noise sources. Without field inspection and measurement, sufficient data are not available to enable quantitative estimates of the noise environments at these sites. It should be noted that the increased density of building and people accompanying Operation Breakthrough will result in further increases in ambient noise levels.

Site	Estimated Ambient Noise Level	Comments
Sacramento, Calif.	Medium-to-High	Local traffic, airport
New Castle County, Del.	Medium-to-High	Rural but near highways
Macon, Ga.	Low-to-Medium	Assuming minimal highway noise
Indianapolis, Ind.	High	Highway, adjacent airport, Indianapolis Speedway
Kalamazoo, Mich.	Medium-to-High	Two miles from airport

Jersey City, N. J.	High	High density urban areas
Memphis, Tenn.	Medium-to-High	Urban area but strong enforcement of anti-noise ordinances
St. Louis, Mo.	High	High density urban area
Houston, Tex.	Medium-to-High	Local traffic, highway, airports
Seattle, Wash.	Medium-to-High	Local traffic, highway, airports
Seattle, Wash. (King Co.)	Medium	Highway

Pending availability of more quantitative data, it is recommended that particular attention be given to noise control measures at all sites where the estimated ambient noise level is high or medium-to-high[*/].

G. Wind Data for Structural Design

Table F gives tabulated wind data for the stations nearest the ten selected sites. These stations, in every case, are airport locations with open exposures. References or data sources are indicated in the column headings. Extreme mile wind speeds corresponding to a mean recurrence interval of 50 years have been presented by Thom (15) in the form of isotachs and are suggested as basic design speeds, provided the appropriate terrain corrections are made. These corrections can be most conveniently applied by use of the power law and the average parameters suggested by Davenport (16, 17). Under most strong wind (neutral) conditions, the mean velocity profile can

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[*/] Subsequent to this report, the background noise levels of the Jersey City site have been measured (NBS Report 10219 entitled "Noise Survey of Jersey City Operation Breakthrough Prototype Site", November 1970.

be described by the expression

$$\frac{V_Z}{V_G} = \left(\frac{Z}{Z_G}\right)^{\alpha} \qquad (2)$$

where V_Z = wind speed at height Z

V_G = gradient wind speed first attained at height Z_G

α = power law exponent

The gradient speed is assumed to be independent of local terrain and therefore equal at station and site. This then allows the calculation of wind speeds at the site if the parameters α and Z_G are known. The following average values have been suggested by Davenport (17).

Type of Terrain	α	Z_G (ft)
Flat open country	.16	900
Rough wooded country, city suburbs	.28	1300
Heavily built up urban centers	.40	1400

Because of their low probability of occurrence, extreme speeds are not usually a satisfactory basis for evaluating structural performance. For this purpose, mean wind speeds for January and July as the mean annual wind speeds are presented in Table F. These data indicate the relative windiness of the 10 localities and also indicate the relative contribution of extratropical cyclones (for example, winter storms) and thunderstorms being associated with the winter months. Also included in Table F are the average number of storms per year which resulted in wind speeds of 47 mph or greater. It will be noted that this speed corresponds to a loading of approximately one-half the design load and would produce up to 250 loading cycles during the 50-year design life of the structure if wind gusts were neglected. The effect of high intensity gusts would be primarily to increase the number of loading cycles, say to 1000 or more during the 50-year life of the structure. Therefore, the data listed in Table F (p. 85), coupled with known properties of atmospheric boundary layers, can be used to establish the mean wind climate at the 10 localities. Information sufficient for design and evaluation of performance can be developed once the estimates of the terrain roughness become available. It is recommended that an inspection of the surrounding terrain or the sites should be made by qualified personnel for the purpose of estimating the effective roughness parameters.

H. Earthquake Data

In the design of buildings to resist lateral seismic forces, the minimum total lateral shear is usually based on the expression

$$V = ZKCW \tag{3}$$

where V = total lateral shear at the base

Z = numerical coefficient which depends on the seismic zone in which the building is to be situated

K = numerical coefficient which depends upon the structural frame characteristics

C = numerical coefficient for the base shear which depends upon the fundamental period of the structure

W = total dead load.

Of the above factors, only Z has a regional variation. Since no reliable method of predicting the time, place and intensity of earthquakes exists, maps have been constructed indicating the areas which have experienced destructive earthquakes in the past. These maps are the only means available at this time by which the location of future destructive earthquakes may be anticipated. Zones range from 0 to 3 and are characterized by the following expected degrees of damage.

Zone	Degree of Damage	Z Value
0	None	0
1	Minor	0.25
2	Moderate	0.50
3	Major	1.0

A number of different seismic maps are in use, their zone boundaries differing only slightly in most cases. Based on the most recent edition of ANSI-A58-Sec. 6, the following seismic zones are suggested for arriving at design loads:

Selected Site	Seismic Zone
Sacramento, California	2
Wilmington, Delaware	1
Macon, Georgia	1
Indianapolis, Indiana	1
Kalamazoo, Michigan	1
St. Louis, Missouri	1
Jersey City, New Jersey	1
Memphis, Tennessee	2
Houston, Texas	1
Seattle, Washington	3

I. Air Contamination Data

Air pollution data for the ten Operation Breakthrough localities are given in Table G. Included are the locations of the sampling sites and the concentrations of suspended particulates, sulfur dioxide, nitrogen dioxide and ammonia. The geometric mean (which gives a better indication of the central tendency of the values than the arithmetic mean), the 90% frequency distribution value (90% of the readings are equal to or less than this value) and the period of years that these averages represent are given in Table G (p. 86). Blank spaces indicate data is not available. These concentrations represent averages at the sampling sites; the values at the particular Breakthrough site will vary and will depend on pollutant sources, and meteorological and topographical factors (19).

Little information is available in the literature concerning application of these data in the design of housing systems. The following statements, taken from reference (20), are given to illustrate a correlation between exposure to sulfur dioxide and particulates and the effects on health.

a. At concentrations ranging from 300-500 $\mu g/m^3$ (microgram per cubic meter) of sulfur dioxide (24-hour mean), with low particulate levels, increased hospital admissions of older persons for respiratory disease may occur; absenteeism from work, particularly with older persons, may also occur.

b. A decrease from 140 to 60 $\mu g/m^3$ (annual mean) in particulate concentrations may be accompanied by a decrease in mean sputum volume in industrial workers.

c. Where concentrations range from 100-130 $\mu g/m^3$ and above for particulates (annual mean) with sulfur dioxide concentrations (annual mean) greater than 120 $\mu g/m^3$, children residing in such areas are likely to experience increased incidence of certain respiratory diseases.

These statements apply to outdoor pollutants, but pollutant levels indoors have not received adequate attention. Considering the fact that people spend most of their lives indoors, the matter of the quality of indoor air becomes very important. Further efforts are recommended to measure indoor and outdoor pollution levels simultaneously to relate them to the various sources of air contaminations, both indoors and outdoors and to other climatic parameters. With this type of information it should be possible to specify air cleaning devices to maintain indoor air at a healthful level of purity.

J. Precipitation Data

Extreme values in 24 hours and normals (1931-1960) of annual totals for rain - and snowfall were obtained from reference (14) and listed in Table A (p. 26), which also shows the snow load in lbs/sq. ft. on the ground as transcribed from reference (12).

K. Summary and Recommendations

Outdoor environmental data required for the design and the evaluation of Breakthrough building systems have been assembled herein from various sources. The parameters included are temperature, humidity, wind, precipitation, solar radiation, ground temperature, soil conditions, background noise level, air contamination and earthquake risk. It is believed that the data presented in this report can be used to prepare preliminary designs for the Breakthrough building programs. However, more detailed and specific information should be prepared as the Breakthrough program progresses, especially for use in the test and evaluation phase.

The following recommendations are made:

1. After review and approval by HUD this report is to be made available to Breakthrough contractors for use in their design work.
2. Continue efforts to add to and refine the data given with special priority to be given to (a) conduct field inspections and measurements of the background noise levels and terrain roughness at the Breakthrough sites, and (b) measure coincident hourly data for air contamination with reference to temperature, humidity and wind data. These coincident data are essential for predicting the indoor environment of a Breakthrough building especially with respect to the design of the indoor environmental control systems.

L. Acknowledgments

The author wishes to acknowledge the assistance of Mr. John W. Bean for his computer data processing of weather parameters, and the cooperation of Mr. Oscar E. Richard, Chief of the Engineering Meteorology Section of the United States Air Force, for the selection of Air Force bases in the vicinity of the Operation Breakthrough sites and the updating of the Manual 88 data.

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Table A

Data for Heating and Cooling Load Calculations

Table A

	Air Temperatures, °F								Annual Temperature, °F 14/*			Ground Temp. °F Upper 10 Ft Average		
	Summer					Winter								
	DB/WB				DB Range	DB		Coincident						Frost
Site Localities (Weather Station)	1%	2½%	5%	10%	°F	99%	97½%	wind	Recorded Highest	Recorded Lowest	Average	Summer	Winter	depth in.
Sacramento, Calif. (Airport)	100/72	97/70	94/69	88/67	36	30	32	VL**	115	23	60	76	57	1
Wilmington, Del. (Airport)	93/99	90/77	87/76	84/74	20	12	15	M	102	-4	54	66	44	6
Macon, Ga. (Airport)	98/80	96/79	94/78	92/77	22	23	27	L	104	3	66	75	57	4
Indianapolis, Ind. (Airport)	93/78	91/77	88/76	86/74	22	0	4	M	99	-18	52	66	43	12
Kalamazoo, Mich. (Grand Rapids AP)	92/76	89/75	86/74	83/71	23	1	5	M	100	-16	48	63	41	12
St. Louis, Mo. (City Office)	96/79	94/78	92/77	89/75	18	7	11	M	106	-11	55	65	43	12
Jersey City, N. J. (Corrected from data of Newark AP)	92/77	89/76	86/75	82/73	20	11	15	M	105	1	53	62	44	6
Memphis, Tenn. (Airport)	98/80	96/79	94/78	91/77	21	17	21	L	106	-13	62	69	50	12
Houston, Tex. (Airport)	96/80	94/80	92/79	90/78	18	28	39	M	106	9	69	81	60	1
Seattle, Wash. (Sea/Tac AP)	85/66	81/64	77/63	72/61	22	20	24	L	99	6	51	59	46	5
Seattle, Wash. (City Office)	81/67	79/65	76/64	-	19	28	32	L	100	11	53	60	47	5

* 14/ and similar nomenclature are numbers for reference citation.

** VL, very light; L, light; M, moderate; H, high. See text, p. 10.

Table A - Continued

Site Localities (Weather Station)	Precipitation Data (1931-1960) Rain, In.14/ Max. 24 hrs.	Rain, In.14/ Mean annual	Snow, In.14/ Max. 24 hrs.	Snow, In.14/ Mean annual	Snow Load12/ (psf)	Solar Radiation Max. Daily Total Unit	% Sunshine14/ Jan.	% Sunshine14/ July
Sacramento, Calif. Airport	5.6	16.3	-	-	5 ~ 10	3620	45	97
Wilmington, Del. Airport	6.2	44.5	15.6	22.5	20	3615	44	66
Macon, Ga. Airport	5.0	44.1	3.7	0.4	5 ~ 10	2130	56	64
Indianapolis, Ind. Airport	3.9	12.7	12.5	20.3	10 ~ 20	3615	43	66
Kalamazoo, Mich. Grand Rapids AP	2.7	31.2	12.6	78.7	20	3600	-	-
St. Louis, Mo. (City Office)	3.3	35.3	11.2	17.2	20	3620	52	71
Jersey City, N. J. (Corrected from the data of Newark AP)	4.7	43.5	26	29.8	20	3610		
Memphis, Tenn. airport	4.9	49.7	16.1	6.6	5 ~ 10	3624	48	73
Houston, Tex. airport	15.7	46.0	4.4	0.4	less than 5	3612	47	74
Seattle, Wash. Sea/Tac AP	3.4	39.0	21.4	14.7	10	3561	14	68
Seattle, Wash. (City Office)	3.3	34.1	11.5	8.1	10	3561	28	63

Table A - Continued

Site Localities (Weather Station)	Seasonal Degree-Days		No. of annual hrs at or above 67 °F WB[3/]
	Seasonal Heating	Seasonal Cooling	
Sacramento, Calif. (Airport)	2773	1411	351
Wilmington, Del. (Airport)	4930	1002	1191
Macon, Ga. (Airport)	2130	2367	3069
Indianapolis, Ind. (Airport)	5699	1033	1462
Kalamazoo, Mich. (Grand Rapids AP)	6998	730	833
St. Louis, Mo. (City Office)	4900	1558	1866
Jersey, City, N. J. (Corrected from data of Newark AP)	5067	965	1290
Memphis, Tenn. (Airport)	3233	2078	2631
Houston, Tex. (Airport)	1400	3175	3695
Seattle, Wash. (Sea/Tac AP)	5145	170	17
Seattle, Wash. (City Office)	4424	-	17

Table B

Solar Radiation

ET:	Equation of time, min.
R:	Solar constant modifier
HO:	Daily total radiation upon horizontal surface, Btu/hr ft^2
BETA:	Solar altitude angle, degree
AZIMUTH:	Solar azimuth angle, measured from north, degree
IDN:	Direct normal radiation, Btu/hr ft^2
DIFF:	Diffuse sky radiation, Btu/hr ft^2

Total solar radiation values (for the clearness[1] number of unity) expected to fall upon vertical wall surfaces from eight compass directions and upon a horizontal surface are tabulated in these tables.

```
LOCATION:   SACRAMENTO, CALIFORNIA

 MONTH= 7    DAY=21     FOR LATITUDE=      38.5   LONGITUDE=     121.5

 ET=  -6.2000    R=     .9690 SUNRZ=    5.0626    HO=  3619.11

                                    CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME   AIR BETA  AZI- IDN DIFF SOUTH SW   WEST   NW   NORTH NE   EAST   SE HORIZ
 HR   TEMP (DEG) MUTH


  1.   71.   0.  13.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  2.   68.   0.  28.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  3.   65.   0.  42.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  4.   64.   0.  53.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  5.   64.   0.  63.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  6.   65.  10.  72. 107.   15.   13.   13.   13.   13.   45.  106.  113.   60.   33.
  7.   68.  22.  81. 196.   27.   30.   30.   30.   30.   59.  178.  210.  136.   99.
  8.   71.  33.  90. 236.   32.   44.   44.   44.   44.   46.  185.  242.  183.  161.
  9.   75.  45. 100. 257.   35.   88.   57.   57.   57.   57.  162.  236.  205.  216.
 10.   80.  56. 113. 268.   36.  126.   67.   67.   67.   67.  123.  204.  206.  259.
 11.   84.  66. 134. 274.   37.  152.   74.   74.   74.   74.   75.  154.  185.  288.
 12.   89.  72. 171. 277.   38.  163.  128.   77.   77.   77.   77.   91.  148.  300.
 13.   93.  69. 213. 276.   37.  158.  172.  129.   76.   76.   76.   76.   96.  295.
 14.   96.  60. 240. 271.   37.  138.  200.  186.  104.   70.   70.   70.   70.  273.
 15.   99.  50. 255. 262.   36.  104.  208.  226.  147.   61.   61.   61.   61.  235.
 16.  100.  38. 267. 246.   33.   61.  195.  243.  178.   50.   50.   50.   50.  185.
 17.  100.  26. 276. 216.   29.   36.  158.  228.  186.   56.   36.   36.   36.  125.
 18.   99.  15. 284. 153.   21.   20.   95.  163.  147.   57.   20.   20.   20.   60.
 19.   96.   4. 293.  14.    2.    1.    6.   14.   14.    7.    1.    1.    1.    3.
 20.   93.   0. 303.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 21.   89.   0. 313.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 22.   84.   0. 326.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 23.   80.   0. 341.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 24.   75.   0. 357.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
LOCATION:    WILMINGTON, DELAWARE

 MONTH= 7    DAY=21     FOR LATITUDE=      39.7   LONGITUDE=      75.6

 ET=  -6.2000    R=     .9690 SUNRZ=    4.9532    HO=  3615.22

                                     CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME   AIR BETA  AZI- IDN DIFF SOUTH SW   WEST   NW   NORTH NE   EAST   SE HORIZ
 HR   TEMP (DEG) MUTH


  1.   77.   0.  14.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  2.   75.   0.  29.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  3.   74.   0.  42.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  4.   73.   0.  54.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  5.   73.    .  64.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  6.   74.  11.  73.  119.   16.   14.   14.   14.   14.   49.  117.  125.   69.   39.
  7.   75.  22.  82.  200.   27.   31.   31.   31.   31.   58.  179.  214.  142.  104.
  8.   77.  34.  91.  237.   32.   48.   45.   45.   45.   45.  182.  242.  187.  165.
  9.   79.  45. 102.  257.   35.   94.   58.   58.   58.   58.  157.  234.  208.  218.
 10.   82.  56. 116.  268.   36.  132.   67.   67.   67.   67.  116.  201.  207.  260.
 11.   84.  66. 138.  274.   37.  157.   79.   74.   74.   74.   74.  150.  186.  287.
 12.   87.  71. 174.  276.   38.  168.  134.   76.   76.   76.   76.   86.  148.  298.
 13.   89.  68. 213.  275.   37.  162.  177.  132.   75.   75.   75.   75.   96.  292.
 14.   91.  59. 239.  270.   37.  140.  203.  188.  103.   69.   69.   69.   69.  269.
 15.   92.  49. 255.  261.   36.  106.  210.  227.  147.   61.   61.   61.   61.  232.
 16.   93.  37. 266.  244.   33.   62.  195.  243.  177.   49.   49.   49.   49.  181.
 17.   93.  26. 276.  214.   29.   35.  157.  227.  184.   55.   35.   35.   35.  122.
 18.   92.  14. 285.  150.   20.   20.   93.  160.  144.   56.   20.   20.   20.   57.
 19.   91.   3. 294.   11.    2.    1.    5.   12.   12.    6.    1.    1.    1.    2.
 20.   89.   0. 303.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 21.   87.   0. 314.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 22.   84.   0. 327.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 23.   82.   0. 342.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 24.   79.   0. 358.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
LOCATION:   MACON, GEORGIA

 MONTH= 7    DAY=21     FOR LATITUDE=      32.7   LONGITUDE=      83.6

 ET=  -6.2000    R=     .9690 SUNRZ=    5.7647     HO=  3621.78

                                  CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME   AIR BETA  AZI- IDN DIFF SOUTH SW   WEST   NW   NORTH NE   EAST   SE HORIZ
 HR   TEMP (DEG) MUTH


  1.   80.   0.    6.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  2.   78.   0.   22.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  3.   77.   0.   37.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  4.   76.   0.   49.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  5.   76.   0.   59.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  6.   77.   3.   68.   4.    1.    0.    0.    0.    0.    2.    5.    5.    2.    1.
  7.   78.  15.   75. 152.   21.   20.   20.   20.   20.   58.  147.  162.   94.   59.
  8.   80.  27.   82. 218.   30.   37.   37.   37.   37.   63.  192.  230.  155.  129.
  9.   83.  40.   90. 249.   34.   52.   52.   52.   52.   52.  187.  243.  187.  192.
 10.   86.  52.   99. 265.   36.   89.   64.   64.   64.   64.  159.  224.  195.  245.
 11.   88.  64.  113. 273.   37.  119.   73.   73.   73.   73.  118.  182.  182.  284.
 12.   91.  75.  141. 278.   38.  136.   86.   73.   78.   78.   78.  124.  151.  305.
 13.   94.  77.  160. 278.   38.  138.  105.   79.   79.   79.   79.  101.  136.  309.
 14.   96.  68.  240. 275.   37.  126.  173.  163.  101.   75.   75.   75.   75.  294.
 15.   97.  57.  257. 269.   37.  101.  193.  211.  146.   67.   67.   67.   67.  261.
 16.   98.  44.  267. 256.   35.   65.  192.  239.  179.   56.   56.   56.   56.  213.
 17.   98.  32.  275. 232.   32.   43.  169.  239.  194.   60.   43.   43.   43.  153.
 18.   97.  19.  282. 183.   25.   27.  120.  195.  172.   63.   27.   27.   27.   65.
 19.   96.   7.  290.  62.    8.    7.   33.   65.   63.   28.    7.    7.    7.   16.
 20.   94.   0.  298.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 21.   91.   0.  307.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 22.   88.   0.  318.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 23.   86.   0.  332.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 24.   83.   0.  348.   0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
LOCATION:    INDIANAPOLIS, INDIANA

 MONTH= 7    DAY=21     FOR LATITUDE=      39.7    LONGITUDE=      86.3

 ET=   -6.2000    R=      .9690 SUNRZ=    5.6614     HO=  3614.96

                                     CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME   AIR BETA   AZI- IDN DIFF SOUTH SW   WEST   NW   NORTH NE  EAST   SE HORIZ
 HR   TEMP (DEG) MUTH


  1.   75.   0.    2.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  2.   73.   0.   18.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  3.   72.   0.   33.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  4.   71.   0.   46.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  5.   71.   0.   57.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  6.   72.   4.   66.   12.    2.    1.    1.    1.    1.    6.   12.   12.    6.    2.
  7.   73.  14.   75.  150.   20.   20.   20.   20.   20.   56.  145.  160.   93.   58.
  8.   75.  26.   84.  214.   29.   35.   35.   35.   35.   55.  184.  227.  157.  122.
  9.   78.  37.   94.  244.   33.   62.   49.   49.   49.   49.  177.  243.  195.  181.
 10.   81.  49.  105.  261.   36.  106.   61.   61.   61.   61.  146.  227.  210.  232.
 11.   83.  59.  121.  270.   37.  141.   69.   69.   69.   69.  103.  188.  204.  269.
 12.   86.  68.  147.  275.   37.  162.   96.   75.   75.   75.   75.  132.  177.  292.
 13.   89.  70.  174.  276.   38.  168.  134.   76.   76.   76.   76.   86.  148.  298.
 14.   91.  66.  222.  274.   37.  158.  187.  150.   74.   74.   74.   74.   79.  287.
 15.   92.  56.  244.  268.   36.  132.  208.  201.  116.   67.   67.   67.   67.  260.
 16.   93.  45.  258.  257.   35.   94.  208.  234.  157.   57.   57.   57.   57.  218.
 17.   93.  34.  269.  237.   32.   48.  187.  242.  182.   45.   45.   45.   45.  165.
 18.   92.  22.  278.  200.   27.   31.  142.  214.  179.   58.   31.   31.   31.  104.
 19.   91.  11.  287.  118.   16.   14.   69.  125.  117.   49.   14.   14.   14.   39.
 20.   89.    .  296.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 21.   86.   0.  306.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 22.   83.   0.  318.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 23.   81.   0.  331.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 24.   78.   0.  346.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
LOCATION:   KALAMAZOO, MICHIGAN

 MONTH= 7   DAY=21     FOR LATITUDE=      42.2   LONGITUDE=      84.5

 ET=  -6.2000    R=     .9690 SUNRZ=    5.4304     HO=  3603.10

                                  CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME  AIR BETA  AZI- IDN  DIFF SOUTH  SW   WEST   NW  NORTH  NE   EAST   SE HORIZ
 HR  TEMP (DEG) MUTH


  1.   73.    0.    4.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  2.   71.    0.   20.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  3.   70.    0.   34.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  4.   69.    0.   47.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  5.   69.    0.   58.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  6.   70.    6.   68.   43.    6.    5.    5.    5.    5.   21.   44.   44.   21.   10.
  7.   71.   16.   77.  165.   22.   22.   22.   22.   22.   58.  156.  177.  107.   69.
  8.   73.   27.   87.  219.   30.   37.   37.   37.   37.   49.  183.  232.  167.  130.
  9.   76.   38.   97.  247.   34.   74.   50.   50.   50.   50.  169.  242.  202.  187.
 10.   79.   49.  110.  262.   36.  118.   61.   61.   61.   61.  135.  222.  215.  234.
 11.   82.   59.  127.  270.   37.  153.   69.   69.   69.   69.   89.  180.  207.  268.
 12.   85.   66.  154.  274.   37.  173.  109.   74.   74.   74.   74.  123.  179.  288.
 13.   88.   68.  170.  275.   37.  177.  135.   75.   75.   75.   75.   93.  160.  292.
 14.   90.   63.  222.  273.   37.  164.  196.  155.   72.   72.   72.   72.   78.  280.
 15.   91.   54.  243.  266.   36.  136.  214.  205.  114.   65.   65.   65.   65.  252.
 16.   92.   44.  258.  255.   35.   95.  211.  236.  155.   56.   56.   56.   56.  210.
 17.   92.   33.  269.  234.   32.   48.  186.  241.  180.   44.   44.   44.   44.  158.
 18.   91.   21.  278.  195.   27.   30.  138.  210.  176.   56.   30.   30.   30.   98.
 19.   90.   11.  288.  112.   15.   13.   64.  118.  111.   47.   13.   13.   13.   36.
 20.   88.     .  298.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 21.   85.    0.  308.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 22.   82.    0.  320.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 23.   79.    0.  333.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 24.   76.    0.  348.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
LOCATION:   ST. LOUIS, MISSOURI

 MONTH= 7   DAY=21    FOR LATITUDE=      38.6   LONGITUDE=      90.2

 ET=  -6.2000   R=    .9690 SUNRZ=   4.9710    HO=  3618.77

                                 CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME  AIR BETA  AZI- IDN DIFF SOUTH SW   WEST  NW  NORTH NE  EAST  SE HORIZ
 HR  TEMP (DEG) MUTH


  1.  81.   0.  14.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  2.  80.   0.  29.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  3.  79.   0.  43.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  4.  78.   0.  54.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  5.  78.    .  64.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  6.  79.  11.  73. 118.  16.  14.  14.  14.  14.  49. 117. 125.  69.  39.
  7.  80.  23.  81. 201.  27.  31.  31.  31.  31.  59. 180. 215. 142. 104.
  8.  81.  34.  90. 238.  32.  47.  46.  46.  46.  46. 184. 242. 186. 167.
  9.  84.  46. 101. 258.  35.  92.  58.  58.  58.  58. 159. 234. 206. 220.
 10.  86.  57. 115. 269.  37. 129.  68.  68.  68.  68. 118. 200. 205. 262.
 11.  88.  67. 137. 275.  37. 154.  78.  74.  74.  74.  74. 149. 183. 289.
 12.  90.  72. 175. 277.  38. 164. 133.  77.  77.  77.  77.  85. 144. 300.
 13.  93.  68. 216. 275.  37. 158. 175. 134.  75.  75.  75.  75.  92. 293.
 14.  94.  60. 241. 271.  37. 136. 201. 190. 108.  70.  70.  70.  70. 270.
 15.  95.  49. 256. 261.  36. 101. 208. 228. 150.  61.  61.  61.  61. 231.
 16.  96.  37. 267. 244.  33.  58. 193. 243. 180.  49.  49.  49.  49. 180.
 17.  96.  25. 276. 212.  29.  35. 154. 225. 185.  56.  35.  35.  35. 119.
 18.  95.  14. 285. 145.  20.  19.  89. 154. 140.  55.  19.  19.  19.  54.
 19.  94.   3. 294.   5.   1.   0.   2.   5.   5.   2.    .    .    .   1.
 20.  93.   0. 304.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 21.  90.   0. 315.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 22.  88.   0. 327.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 23.  86.   0. 342.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 24.  84.   0. 358.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
```

```
LOCATION:    JERSEY CITY, NEW JERSEY

 MONTH= 7    DAY=21     FOR LATITUDE=      40.7    LONGITUDE=      74.2

 ET=  -6.2000    R=      .9690 SUNRZ=    4.8117     HO=  3610.80

                                   CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME   AIR BETA  AZI- IDN DIFF SOUTH SW   WEST  NW  NORTH NE  EAST  SE HORIZ
 HR  TEMP (DEG) MUTH


  1.  76.   0.  15.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  2.  74.   0.  30.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  3.  73.   0.  43.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  4.  72.   0.  54.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  5.  72.   2.  65.   1.   0.   0.   0.   0.   0.   0.   1.   1.   0.   0.
  6.  73.  13.  74. 133.  18.  17.  17.  17.  17.  52. 130. 141.  79.  47.
  7.  74.  24.  83. 205.  28.  33.  33.  33.  33.  56. 181. 219. 148. 110.
  8.  76.  35.  93. 240.  33.  55.  47.  47.  47.  47. 179. 243. 191. 170.
  9.  78.  46. 104. 258.  35. 101.  58.  58.  58.  58. 151. 232. 211. 222.
 10.  81.  57. 119. 269.  37. 138.  68.  68.  68.  68. 109. 196. 209. 262.
 11.  83.  66. 142. 274.  37. 163.  88.  74.  74.  74.  74. 143. 186. 287.
 12.  86.  70. 178. 276.  38. 172. 142.  76.  76.  76.  76.  79. 146. 296.
 13.  88.  66. 215. 274.  37. 165. 183. 138.  74.  74.  74.  74.  93. 288.
 14.  90.  58. 239. 269.  37. 141. 207. 192. 104.  68.  68.  68.  68. 265.
 15.  91.  47. 255. 260.  35. 105. 212. 229. 147.  59.  59.  59.  59. 226.
 16.  92.  36. 266. 242.  33.  60. 194. 243. 177.  48.  48.  48.  48. 176.
 17.  92.  25. 276. 210.  29.  34. 154. 224. 183.  55.  34.  34.  34. 116.
 18.  91.  14. 285. 143.  19.  18.  87. 152. 139.  55.  18.  18.  18.  53.
 19.  90.   3. 294.   6.   1.   1.   3.   6.   6.   3.   1.   1.   1.   1.
 20.  88.   0. 304.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 21.  86.   0. 316.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 22.  83.   0. 329.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 23.  81.   0. 343.   0.   0.   0.   0.   0    0.   0.   0.   0.   0.   0.
 24.  78.   0. 359.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
```

```
LOCATION:   MEMPHIS, TENNESSEE

 MONTH= 7   DAY=21    FOR LATITUDE=     35.1   LONGITUDE=     90.0

 ET=  -6.2000   R=     .9690 SUNRZ=   5.1008    HO=  3624.19

                                     CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME  AIR BETA  AZI- IDN DIFF SOUTH SW   WEST  NW   NORTH NE  EAST  SE HORIZ
 HR  TEMP (DEG) MUTH


  1.  81.   0.  15.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  2.  79.   0.  30.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  3.  78.   0.  44.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  4.  77.   0.  55.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  5.  77.   0.  64.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  6.  78.  10.  72. 108.  15.  13.  13.  13.  13.  45. 107. 114.  61.  34.
  7.  79.  22.  80. 199.  27.  31.  31.  31.  31.  62. 181. 212. 137. 102.
  8.  81.  34.  88. 238.  32.  46.  46.  46.  46.  52. 189. 242. 180. 167.
  9.  83.  47.  97. 259.  35.  81.  59.  59.  59.  59. 167. 235. 199. 223.
 10.  86.  59. 110. 270.  37. 117.  69.  69.  69.  69. 129. 202. 196. 267.
 11.  89.  69. 131. 276.  37. 140.  76.  76.  76.  76.  82. 150. 174. 295.
 12.  92.  75. 174. 278.  38. 150. 124.  78.  78.  78.  78.  86. 134. 306.
 13.  94.  71. 222. 276.  38. 143. 166. 137.  77.  77.  77.  77.  81. 299.
 14.  96.  61. 247. 271.  37. 123. 193. 192. 120.  71.  71.  71.  71. 274.
 15.  97.  49. 260. 262.  36.  90. 200. 230. 160.  61.  61.  61.  61. 234.
 16.  98.  37. 270. 244.  33.  49. 186. 243. 187.  49.  49.  49.  49. 180.
 17.  98.  25. 278. 210.  29.  34. 148. 223. 187.  61.  34.  34.  34. 116.
 18.  97.  13. 286. 135.  18.  17.  81. 143. 132.  53.  17.  17.  17.  48.
 19.  96.   1. 294.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 20.  94.   0. 303.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 21.  92.   0. 314.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 22.  89.   0. 327.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 23.  86.   0. 342.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 24.  83.   0. 358.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
```

```
LOCATION:    HOUSTON, TEXAS

 MONTH= 7    DAY=21     FOR LATITUDE=      29.6    LONGITUDE=       95.3

 ET=  -6.2000    R=      .9690 SUNRZ=    5.6457     HO=  3611.36

                             CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME   AIR BETA  AZI- IDN DIFF SOUTH SW   WEST   NW   NORTH NE  EAST   SE HORIZ
 HR   TEMP (DEG) MUTH


  1.   81.   0.   10.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  2.   80.   0.   27.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  3.   79.   0.   41.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  4.   78.   0.   52.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  5.   78.   0.   61.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  6.   79.   4.   69.  21.   3.   2.   2.   2.   2.  10.  22.  22.  11.   5.
  7.   60.  17.   76. 167.  23.  23.  23.  23.  23.  62. 161. 178. 105.  71.
  8.   81.  29.   82. 226.  31.  40.  40.  40.  40.  67. 197. 235. 159. 142.
  9.   84.  42.   89. 253.  34.  55.  55.  55.  55.  58. 189. 241. 184. 205.
 10.   86.  55.   97. 268.  36.  85.  67.  67.  67.  67. 160. 217. 186. 257.
 11.   88.  68.  110. 275.  37. 111.  75.  75.  75.  75. 118. 171. 168. 293.
 12.   90.  79.  145. 279.  38. 124.  89.  80.  80.  80.  80. 111. 133. 311.
 13.   93.  78.  220. 278.  38. 123. 137. 116.  79.  79.  79.  79.  84. 310.
 14.   94.  67.  251. 275.  37. 109. 171. 176. 122.  75.  75.  75.  75. 290.
 15.   95.  54.  264. 267.  36.  83. 187. 220. 163.  66.  66.  66.  66. 253.
 16.   96.  41.  272. 251.  34.  53. 183. 242. 191.  59.  53.  53.  53. 200.
 17.   96.  28.  278. 222.  30.  39. 155. 232. 196.  67.  39.  39.  39. 136.
 18.   95.  16.  285. 159.  22.  21.  98. 170. 154.  61.  21.  21.  21.  64.
 19.   94.   3.  292.   8.   1.   1.   4.   9.   9.   4.   1.   1.   1.   2.
 20.   93.   0.  299.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 21.   90.   0.  309.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 22.   88.   0.  320.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 23.   86.   0.  335.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
 24.   84.   0.  352.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
```

```
LOCATION:   SEATTLE, WASHINGTON (AIRPORT)

 MONTH= 7    DAY=21     FOR LATITUDE=      47.4    LONGITUDE=     122.3

 ET=  -6.2000    R=      .9690 SUNRZ=    4.6734    HO=  3562.21

                               CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME   AIR  BETA  AZI-   IDN  DIFF SOUTH    SW  WEST    NW NORTH    NE  EAST    SE HORIZ
 HR   TEMP (DEG)  MUTH


  1.   67.    0.   11.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  2.   65.    0.   26.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  3.   64.    0.   39.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  4.   63.    0.   52.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  5.   63.    3.   63.    6.    1.    1.    1.    1.    1.    3.    6.    6.    2.    1.
  6.   64.   12.   73.  130.   18.   16.   16.   16.   16.   53.  128.  138.   76.   45.
  7.   65.   22.   84.  199.   27.   31.   31.   31.   31.   51.  174.  214.  146.  102.
  8.   67.   32.   95.  234.   32.   60.   43.   43.   43.   43.  171.  240.  194.  157.
  9.   70.   42.  107.  253.   34.  110.   54.   54.   54.   54.  141.  233.  220.  205.
 10.   73.   51.  123.  264.   36.  153.   63.   63.   63.   63.   97.  201.  224.  242.
 11.   75.   59.  144.  270.   37.  182.   91.   69.   69.   69.   69.  151.  207.  268.
 12.   78.   63.  172.  272.   37.  196.  147.   72.   72.   72.   72.   89.  172.  279.
 13.   81.   61.  202.  272.   37.  191.  191.  120.   71.   71.   71.   71.  121.  275.
 14.   83.   56.  227.  268.   36.  170.  218.  177.   72.   67.   67.   67.   67.  257.
 15.   84.   47.  245.  259.   35.  133.  225.  219.  120.   59.   59.   59.   59.  225.
 16.   85.   37.  259.  245.   33.   86.  210.  240.  158.   49.   49.   49.   49.  162.
 17.   85.   27.  271.  219.   30.   37.  173.  232.  177.   40.   37.   37.   37.  131.
 18.   84.   17.  281.  172.   23.   24.  115.  185.  160.   56.   24.   24.   24.   75.
 19.   83.    8.  292.   72.   10.    8.   36.   75.   74.   35.    8.    8.    8.   19.
 20.   81.    0.  303.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 21.   78.    0.  314.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 22.   75.    0.  327.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 23.   73.    0.  341.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
 24.   70.    0.  356.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

```
LOCATION:   SEATTLE, WASHINGTON (CITY)

 MONTH= 7    DAY=21     FOR LATITUDE=     47.6    LONGITUDE=     122.3

 ET=  -6.2000    R=     .9690 SUNRZ=   4.6668     HO=  3560.77

                                CALCULATED SOLAR RADIATION DATA, BTU/HR (SQ. FT.)


TIME   AIR BETA  AZI- IDN DIFF SOUTH SW   WEST   NW   NORTH NE   EAST   SE HORIZ
 HR   TEMP (DEG) MUTH


   1.   66.    0.  11.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
   2.   64.    0.  26.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
   3.   63.    0.  39.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
   4.   62.    0.  51.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
   5.   62.    3.  63.    6.    1.    1.    1.    1.    1.    3.    6.    6.    2.    1.
   6.   63.   12.  73.  130.   18.   16.   16.   16.   16.   53.  128.  138.   77.   46.
   7.   64.   22.  84.  199.   27.   31.   31.   31.   31.   51.  174.  214.  146.  102.
   8.   66.   32.  95.  234.   32.   60.   43.   43.   43.   43.  171.  240.  194.  157.
   9.   68.   42. 107.  253.   34.  110.   54.   54.   54.   54.  141.  233.  220.  204.
  10.   70.   51. 123.  264.   36.  153.   63.   63.   63.   63.   97.  201.  224.  242.
  11.   73.   59. 144.  270.   37.  183.   92.   69.   69.   69.   69.  151.  207.  267.
  12.   75.   63. 172.  272.   37.  196.  148.   72.   72.   72.   72.   89.  172.  279.
  13.   77.   61. 202.  272.   37.  192.  191.  120.   71.   71.   71.   71.  122.  275.
  14.   79.   55. 227.  268.   36.  170.  218.  177.   71.   67.   67.   67.   67.  257.
  15.   80.   47. 245.  259.   35.  134.  225.  219.  119.   59.   59.   59.   59.  225.
  16.   81.   37. 259.  245.   33.   87.  210.  240.  158.   49.   49.   49.   49.  182.
  17.   81.   27. 271.  220.   30.   38.  174.  232.  177.   40.   38.   38.   38.  131.
  18.   80.   17. 281.  172.   23.   24.  115.  185.  161.   56.   24.   24.   24.   75.
  19.   79.    8. 292.   73.   10.    8.   37.   76.   75.   35.    8.    8.    8.   20.
  20.   77.    0. 303.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  21.   75.    0. 314.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  22.   73.    0. 327.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  23.   70.    0. 341.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
  24.   68.    0. 356.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
```

Table C

Sol-air Temperatures

Sol-air temperature values tabulated in these tables are obtained from the solar radiation values of Table B and estimated outdoor air temperature profiles of a design day using equation (1) of the text.

```
LOCATION:   SACRAMENTO, CALIFORNIA

 MONTH= 7    DAY=21     FOR LATITUDE=      38.5    LONGITUDE=     121.5

ALPHA/H=        .150

                         SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR   SOUTH   SW    WEST    NW    NORTH   NE    EAST    SE    HORIZ
(HR)    TEMP
   1.    71.    71.    71.    71.    71.    71.    71.    71.    71.    64.
   2.    68.    68.    68.    68.    68.    68.    68.    68.    68.    61.
   3.    65.    65.    65.    65.    65.    65.    65.    65.    65.    58.
   4.    64.    64.    64.    64.    64.    64.    64.    64.    64.    57.
   5.    64.    64.    64.    64.    64.    64.    64.    64.    64.    57.
   6.    65.    67.    67.    67.    67.    72.    81.    82.    74.    63.
   7.    68.    72.    72.    72.    72.    77.    94.    99.    88.    75.
   8.    71.    78.    78.    78.    78.    78.    99.   107.    98.    88.
   9.    75.    88.    84.    84.    84.    84.    99.   110.   106.   100.
  10.    80.    98.    90.    90.    90.    90.    98.   110.   110.   112.
  11.    84.   107.    95.    95.    95.    95.    96.   107.   112.   121.
  12.    89.   113.   108.   100.   100.   100.   100.   103.   111.   127.
  13.    93.   117.   119.   112.   104.   104.   104.   104.   107.   130.
  14.    96.   117.   126.   124.   112.   107.   107.   107.   107.   130.
  15.    99.   114.   130.   133.   121.   108.   108.   108.   108.   127.
  16.   100.   109.   129.   136.   127.   107.   107.   107.   107.   121.
  17.   100.   105.   124.   134.   128.   108.   105.   105.   105.   112.
  18.    99.   102.   113.   123.   121.   107.   102.   102.   102.   101.
  19.    96.    97.    97.    98.    98.    97.    97.    97.    97.    90.
  20.    93.    93.    93.    93.    93.    93.    93.    93.    93.    86.
  21.    89.    89.    89.    89.    89.    89.    89.    89.    89.    82.
  22.    84.    84.    84.    84.    84.    84.    84.    84.    84.    77.
  23.    80.    80.    80.    80.    80.    80.    80.    80.    80.    73.
  24.    75.    75.    75.    75.    75.    75.    75.    75.    75.    68.
```

```
LOCATION:    SACRAMENTO, CALIFORNIA

 MONTH= 7    DAY=21     FOR LATITUDE=      38.5   LONGITUDE=     121.5

ALPHA/H=        .300

                          SOL-AIR TEMPERATURES (DEG. F)


TIME   AIR  SOUTH   SW   WEST    NW   NORTH   NE   EAST    SE   HORIZ
(HR)   TEMP
  1.   71.   71.   71.   71.   71.   71.   71.   71.   71.   64.
  2.   68.   68.   68.   68.   68.   68.   68.   68.   68.   61.
  3.   65.   65.   65.   65.   65.   65.   65.   65.   65.   58.
  4.   64.   64.   64.   64.   64.   64.   64.   64.   64.   57.
  5.   64.   64.   64.   64.   64.   64.   64.   64.   64.   57.
  6.   65.   69.   69.   69.   69.   79.   97.   99.   83.   68.
  7.   68.   77.   77.   77.   77.   85.  121.  131.  108.   90.
  8.   71.   84.   84.   84.   84.   85.  126.  143.  126.  112.
  9.   75.  101.   92.   92.   92.   92.  124.  146.  137.  133.
 10.   80.  117.  100.  100.  100.  100.  116.  141.  141.  150.
 11.   84.  130.  107.  107.  107.  107.  107.  130.  140.  164.
 12.   89.  138.  127.  112.  112.  112.  112.  116.  133.  172.
 13.   93.  141.  145.  132.  116.  116.  116.  116.  122.  175.
 14.   96.  138.  156.  152.  128.  118.  118.  118.  118.  171.
 15.   99.  130.  161.  167.  143.  117.  117.  117.  117.  162.
 16.  100.  118.  158.  173.  153.  115.  115.  115.  115.  148.
 17.  100.  111.  148.  169.  156.  117.  111.  111.  111.  130.
 18.   99.  105.  127.  148.  143.  116.  105.  105.  105.  110.
 19.   96.   97.   98.  101.  101.   98.   97.   97.   97.   90.
 20.   93.   93.   93.   93.   93.   93.   93.   93.   93.   86.
 21.   89.   89.   89.   89.   89.   89.   89.   89.   89.   82.
 22.   84.   84.   84.   84.   84.   84.   84.   84.   84.   77.
 23.   80.   80.   80.   80.   80.   80.   80.   80.   80.   73.
 24.   75.   75.   75.   75.   75.   75.   75.   75.   75.   68.
```

```
LOCATION:   WILMINGTON, DELAWARE

 MONTH= 7   DAY=21    FOR LATITUDE=     39.7  LONGITUDE=     75.6

ALPHA/H=       .150

                        SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR  SOUTH   SW    WEST    NW    NORTH  NE    EAST    SE    HORIZ
(HR)    TEMP
   1.    77.    77.    77.    77.    77.    77.    77.    77.    77.    70.
   2.    75.    75.    75.    75.    75.    75.    75.    75.    75.    68.
   3.    74.    74.    74.    74.    74.    74.    74.    74.    74.    67.
   4.    73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
   5.    73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
   6.    74.    76.    76.    76.    76.    81.    91.    92.    84.    73.
   7.    75.    80.    80.    80.    80.    84.   102.   107.    96.    84.
   8.    77.    84.    84.    84.    84.    84.   104.   113.   105.    95.
   9.    79.    93.    88.    88.    88.    88.   103.   114.   110.   105.
  10.    82.   101.    92.    92.    92.    92.    99.   112.   113.   114.
  11.    84.   108.    96.    95.    95.    95.    95.   107.   112.   120.
  12.    87.   112.   107.    98.    98.    98.    98.   100.   109.   125.
  13.    89.   113.   116.   109.   100.   100.   100.   100.   104.   126.
  14.    91.   112.   122.   119.   106.   101.   101.   101.   101.   124.
  15.    92.   108.   124.   126.   114.   101.   101.   101.   101.   120.
  16.    93.   102.   122.   129.   120.   100.   100.   100.   100.   113.
  17.    93.    98.   117.   127.   121.   101.    98.    98.    98.   104.
  18.    92.    95.   106.   116.   114.   101.    95.    95.    95.    94.
  19.    91.    91.    92.    93.    93.    92.    91.    91.    91.    84.
  20.    89.    89.    89.    89.    89.    89.    89.    89.    89.    82.
  21.    87.    87.    87.    87.    87.    87.    87.    87.    87.    80.
  22.    84.    84.    84.    84.    84.    84.    84.    84.    84.    77.
  23.    82.    82.    82.    82.    82.    82.    82.    82.    82.    75.
  24.    79.    79.    79.    79.    79.    79.    79.    79.    79.    72.
```

```
LOCATION:    WILMINGTON, DELAWARE

 MONTH= 7    DAY=21     FOR LATITUDE=      39.7   LONGITUDE=       75.6

ALPHA/H=        .300

                         SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR   SOUTH   SW     WEST     NW     NORTH   NE     EAST     SE     HORIZ
(HR)    TEMP
   1.    77.    77.    77.    77.    77.    77.    77.    77.    77.    70.
   2.    75.    75.    75.    75.    75.    75.    75.    75.    75.    68.
   3.    74.    74.    74.    74.    74.    74.    74.    74.    74.    67.
   4.    73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
   5.    73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
   6.    74.    78.    78.    78.    78.    88.   109.   111.    94.    78.
   7.    75.    84.    84.    84.    84.    92.   129.   139.   117.    99.
   8.    77.    91.    90.    90.    90.    90.   132.   150.   133.   119.
   9.    79.   107.    96.    96.    96.    96.   126.   149.   142.   138.
  10.    82.   121.   102.   102.   102.   102.   117.   142.   144.   153.
  11.    84.   132.   108.   106.   106.   106.   106.   129.   140.   163.
  12.    87.   137.   127.   110.   110.   110.   110.   113.   131.   169.
  13.    89.   138.   142.   129.   112.   112.   112.   112.   118.   170.
  14.    91.   133.   152.   147.   122.   112.   112.   112.   112.   165.
  15.    92.   124.   155.   160.   136.   110.   110.   110.   110.   155.
  16.    93.   111.   152.   166.   146.   108.   108.   108.   108.   140.
  17.    93.   104.   140.   161.   148.   109.   104.   104.   104.   123.
  18.    92.    98.   120.   140.   136.   109.    98.    98.    98.   103.
  19.    91.    91.    93.    94.    95.    93.    91.    91.    91.    85.
  20.    89.    89.    89.    89.    89.    89.    89.    89.    89.    82.
  21.    87.    87.    87.    87.    87.    87.    87.    87.    87.    80.
  22.    84.    84.    84.    84.    84.    84.    84.    84.    84.    77.
  23.    82.    82.    82.    82.    82.    82.    82.    82.    82.    75.
  24.    79.    79.    79.    79.    79.    79.    79.    79.    79.    72.
```

```
LOCATION:    MACON, GEORGIA

 MONTH= 7    DAY=21     FOR LATITUDE=      32.7   LONGITUDE=      83.6

ALPHA/H=        .150

                         SOL-AIR TEMPERATURES (DEG. F)


TIME   AIR   SOUTH   SW    WEST    NW    NORTH   NE    EAST    SE    HORIZ
(HR)   TEMP
   1.   80.    80.   80.    80.   80.    80.   80.    80.   80.    73.
   2.   78.    78.   78.    78.   78.    78.   78.    78.   78.    71.
   3.   77.    77.   77.    77.   77.    77.   77.    77.   77.    70.
   4.   76.    76.   76.    76.   76.    76.   76.    76.   76.    69.
   5.   76.    76.   76.    76.   76.    76.   76.    76.   76.    69.
   6.   77.    77.   77.    77.   77.    77.   77.    77.   77.    70.
   7.   78.    81.   81.    81.   81.    87.  100.   103.   92.    80.
   8.   80.    86.   86.    86.   86.    90.  109.   115.  103.    93.
   9.   83.    90.   90.    90.   90.    91.  111.   119.  111.   105.
  10.   86.    99.   95.    95.   95.    95.  109.   119.  115.   115.
  11.   88.   106.   99.    99.   99.    99.  106.   116.  116.   124.
  12.   91.   112.  104.   103.  103.   103.  103.   110.  114.   130.
  13.   94.   114.  110.   106.  106.   106.  106.   109.  114.   133.
  14.   96.   115.  122.   120.  111.   107.  107.   107.  107.   133.
  15.   97.   112.  126.   129.  119.   107.  107.   107.  107.   129.
  16.   98.   108.  127.   134.  125.   106.  106.   106.  106.   123.
  17.   98.   104.  123.   134.  127.   107.  104.   104.  104.   114.
  18.   97.   101.  115.   127.  123.   107.  101.   101.  101.   103.
  19.   96.    97.  101.   106.  105.   100.   97.    97.   97.    91.
  20.   94.    94.   94.    94.   94.    94.   94.    94.   94.    87.
  21.   91.    91.   91.    91.   91.    91.   91.    91.   91.    84.
  22.   88.    88.   88.    88.   88.    88.   88.    88.   88.    81.
  23.   86.    86.   86.    86.   86.    86.   86.    86.   86.    79.
  24.   83.    83.   83.    83.   83.    83.   83.    83.   83.    76.
```

```
LOCATION:    MACON, GEORGIA

 MONTH= 7    DAY=21     FOR LATITUDE=      32.7   LONGITUDE=      83.6

ALPHA/H=         .300

                            SOL-AIR TEMPERATURES (DEG. F)


TIME     AIR   SOUTH   SW    WEST    NW    NORTH   NE    EAST    SE    HORIZ
(HR)     TEMP
   1.     80.    80.    80.    80.    80.    80.    80.    80.    80.    73.
   2.     78.    78.    78.    78.    78.    78.    78.    78.    78.    71.
   3.     77.    77.    77.    77.    77.    77.    77.    77.    77.    70.
   4.     76.    76.    76.    76.    76.    76.    76.    76.    76.    69.
   5.     76.    76.    76.    76.    76.    76.    76.    76.    76.    69.
   6.     77.    77.    77.    77.    77.    77.    78.    78.    77.    70.
   7.     78.    84.    84.    84.    84.    96.   122.   127.   106.    89.
   8.     80.    91.    91.    91.    91.    99.   138.   149.   127.   112.
   9.     83.    98.    98.    98.    98.    98.   139.   156.   139.   133.
  10.     86.   112.   105.   105.   105.   105.   133.   153.   144.   152.
  11.     88.   124.   110.   110.   110.   110.   124.   143.   143.   167.
  12.     91.   132.   117.   115.   115.   115.   115.   129.   137.   176.
  13.     94.   135.   125.   117.   117.   117.   117.   124.   135.   179.
  14.     96.   134.   148.   145.   126.   118.   118.   118.   118.   177.
  15.     97.   128.   155.   161.   141.   117.   117.   117.   117.   169.
  16.     98.   118.   156.   170.   152.   115.   115.   115.   115.   155.
  17.     98.   111.   149.   170.   156.   116.   111.   111.   111.   137.
  18.     97.   105.   133.   156.   149.   116.   105.   105.   105.   116.
  19.     96.    98.   106.   115.   115.   104.    98.    98.    98.    94.
  20.     94.    94.    94.    94.    94.    94.    94.    94.    94.    87.
  21.     91.    91.    91.    91.    91.    91.    91.    91.    91.    84.
  22.     88.    88.    88.    88.    88.    88.    88.    88.    88.    81.
  23.     86.    86.    86.    86.    86.    86.    86.    86.    86.    79.
  24.     83.    83.    83.    83.    83.    83.    83.    83.    83.    76.
```

```
LOCATION:   INDIANAPOLIS, INDIANA

 MONTH= 7   DAY=21    FOR LATITUDE=     39.7   LONGITUDE=     86.3

ALPHA/H=       .150

                    SOL-AIR TEMPERATURES (DEG. F)


TIME  AIR   SOUTH  SW   WEST   NW   NORTH  NE   EAST   SE   HORIZ
(HR)  TEMP
  1.   75.   75.   75.   75.   75.   75.   75.   75.   75.   68.
  2.   73.   73.   73.   73.   73.   73.   73.   73.   73.   66.
  3.   72.   72.   72.   72.   72.   72.   72.   72.   72.   65.
  4.   71.   71.   71.   71.   71.   71.   71.   71.   71.   64.
  5.   71.   71.   71.   71.   71.   71.   71.   71.   71.   64.
  6.   72.   72.   72.   72.   72.   73.   74.   74.   73.   65.
  7.   73.   76.   76.   76.   76.   82.   95.   97.   87.   75.
  8.   75.   81.   81.   81.   81.   83.  103.  109.   99.   87.
  9.   78.   87.   85.   85.   85.   85.  104.  114.  107.   98.
 10.   81.   96.   90.   90.   90.   90.  103.  115.  112.  108.
 11.   83.  105.   94.   94.   94.   94.   99.  112.  114.  117.
 12.   86.  111.  101.   97.   97.   97.   97.  106.  113.  123.
 13.   89.  114.  109.  100.  100.  100.  100.  102.  111.  126.
 14.   91.  114.  119.  113.  102.  102.  102.  102.  103.  127.
 15.   92.  112.  123.  122.  110.  102.  102.  102.  102.  124.
 16.   93.  107.  124.  128.  117.  102.  102.  102.  102.  119.
 17.   93.  100.  121.  129.  120.  100.  100.  100.  100.  111.
 18.   92.   97.  113.  124.  119.  101.   97.   97.   97.  101.
 19.   91.   93.  101.  110.  108.   98.   93.   93.   93.   90.
 20.   89.   89.   89.   89.   89.   89.   89.   89.   89.   82.
 21.   86.   86.   86.   86.   86.   86.   86.   86.   86.   79.
 22.   83.   83.   83.   83.   83.   83.   83.   83.   83.   76.
 23.   81.   81.   81.   81.   81.   81.   81.   81.   81.   74.
 24.   78.   78.   78.   78.   78.   78.   78.   78.   78.   71.
```

```
LOCATION:    INDIANAPOLIS, INDIANA

 MONTH= 7    DAY=21     FOR LATITUDE=      39.7   LONGITUDE=      86.3

ALPHA/H=        .300

                              SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR   SOUTH   SW     WEST    NW    NORTH   NE    EAST    SE    HORIZ
(HR)    TEMP
   1.    75.    75.    75.    75.    75.    75.    75.    75.    75.    68.
   2.    73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
   3.    72.    72.    72.    72.    72.    72.    72.    72.    72.    65.
   4.    71.    71.    71.    71.    71.    71.    71.    71.    71.    64.
   5.    71.    71.    71.    71.    71.    71.    71.    71.    71.    64.
   6.    72.    72.    72.    72.    72.    74.    75.    75.    73.    65.
   7.    73.    79.    79.    79.    79.    90.   117.   121.   101.    84.
   8.    75.    86.    86.    86.    86.    92.   131.   143.   122.   105.
   9.    78.    96.    92.    92.    92.    92.   131.   151.   136.   125.
  10.    81.   112.    99.    99.    99.    99.   124.   149.   144.   143.
  11.    83.   126.   104.   104.   104.   104.   114.   140.   145.   157.
  12.    86.   135.   115.   109.   109.   109.   109.   126.   139.   167.
  13.    89.   139.   129.   112.   112.   112.   112.   115.   133.   171.
  14.    91.   138.   147.   136.   113.   113.   113.   113.   115.   170.
  15.    92.   132.   155.   153.   127.   112.   112.   112.   112.   163.
  16.    93.   121.   155.   163.   140.   110.   110.   110.   110.   151.
  17.    93.   108.   149.   166.   148.   107.   107.   107.   107.   135.
  18.    92.   102.   135.   156.   146.   110.   102.   102.   102.   116.
  19.    91.    95.   111.   128.   126.   105.    95.    95.    95.    96.
  20.    89.    89.    89.    89.    89.    89.    89.    89.    89.    82.
  21.    86.    86.    86.    86.    86.    86.    86.    86.    86.    79.
  22.    83.    83.    83.    83.    83.    83.    83.    83.    83.    76.
  23.    81.    81.    81.    81.    81.    81.    81.    81.    81.    74.
  24.    78.    78.    78.    78.    78.    78.    78.    78.    78.    71.
```

```
LOCATION:    KALAMAZOO, MICHIGAN

 MONTH= 7    DAY=21     FOR LATITUDE=      42.2   LONGITUDE=      84.5

ALPHA/H=        .150

                          SOL-AIR TEMPERATURES (DEG. F)


TIME     AIR   SOUTH   SW     WEST     NW     NORTH   NE     EAST     SE     HORIZ
(HR)     TEMP
   1.     73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
   2.     71.    71.    71.    71.    71.    71.    71.    71.    71.    64.
   3.     70.    70.    70.    70.    70.    70.    70.    70.    70.    63.
   4.     69.    69.    69.    69.    69.    69.    69.    69.    69.    62.
   5.     69.    69.    69.    69.    69.    69.    69.    69.    69.    62.
   6.     70.    70.    70.    70.    70.    73.    76.    76.    73.    64.
   7.     71.    75.    75.    75.    75.    80.    95.    98.    87.    75.
   8.     73.    79.    79.    79.    79.    81.   101.   108.    98.    86.
   9.     76.    87.    84.    84.    84.    84.   101.   112.   106.    97.
  10.     79.    97.    88.    88.    88.    88.    99.   112.   111.   107.
  11.     82.   105.    92.    92.    92.    92.    95.   109.   113.   115.
  12.     85.   111.   101.    96.    96.    96.    96.   103.   112.   121.
  13.     88.   114.   108.    99.    99.    99.    99.   101.   112.   124.
  14.     90.   114.   119.   113.   101.   101.   101.   101.   101.   125.
  15.     91.   112.   123.   122.   108.   101.   101.   101.   101.   122.
  16.     92.   106.   124.   127.   115.   100.   100.   100.   100.   117.
  17.     92.    99.   120.   128.   119.    99.    99.    99.    99.   109.
  18.     91.    96.   112.   123.   118.   100.    96.    96.    96.    99.
  19.     90.    92.    99.   107.   106.    97.    92.    92.    92.    88.
  20.     88.    88.    88.    88.    88.    88.    88.    88.    88.    81.
  21.     85.    85.    85.    85.    85.    85.    85.    85.    85.    78.
  22.     82.    82.    82.    82.    82.    82.    82.    82.    82.    75.
  23.     79.    79.    79.    79.    79.    79.    79.    79.    79.    72.
  24.     76.    76.    76.    76.    76.    76.    76.    76.    76.    69.
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```
LOCATION:    KALAMAZOO, MICHIGAN

 MONTH= 7    DAY=21      FOR LATITUDE=      42.2    LONGITUDE=      84.5

ALPHA/H=        .300

                             SOL-AIR TEMPERATURES (DEG. F)


TIME     AIR   SOUTH   SW    WEST     NW    NORTH   NE    EAST     SE    HORIZ
(HR)     TEMP
   1.     73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
   2.     71.    71.    71.    71.    71.    71.    71.    71.    71.    64.
   3.     70.    70.    70.    70.    70.    70.    70.    70.    70.    63.
   4.     69.    69.    69.    69.    69.    69.    69.    69.    69.    62.
   5.     69.    69.    69.    69.    69.    69.    69.    69.    69.    62.
   6.     70.    71.    71.    71.    71.    76.    83.    83.    76.    66.
   7.     71.    78.    78.    78.    78.    89.   118.   124.   103.    85.
   8.     73.    85.    85.    85.    85.    88.   128.   143.   123.   106.
   9.     76.    98.    91.    91.    91.    91.   127.   149.   137.   125.
  10.     79.   114.    97.    97.    97.    97.   119.   146.   144.   142.
  11.     82.   128.   103.   103.   103.   103.   109.   136.   144.   156.
  12.     85.   137.   118.   107.   107.   107.   107.   122.   139.   164.
  13.     88.   141.   128.   110.   110.   110.   110.   115.   136.   168.
  14.     90.   139.   149.   136.   111.   111.   111.   111.   113.   167.
  15.     91.   132.   155.   153.   125.   111.   111.   111.   111.   160.
  16.     92.   121.   155.   163.   138.   109.   109.   109.   109.   148.
  17.     92.   106.   148.   164.   146.   105.   105.   105.   105.   132.
  18.     91.   100.   133.   154.   144.   108.   100.   100.   100.   114.
  19.     90.    94.   109.   125.   123.   104.    94.    94.    94.    93.
  20.     88.    88.    88.    88.    88.    88.    88.    88.    88.    81.
  21.     85.    85.    85.    85.    85.    85.    85.    85.    85.    78.
  22.     82.    82.    82.    82.    82.    82.    82.    82.    82.    75.
  23.     79.    79.    79.    79.    79.    79.    79.    79.    79.    72.
  24.     76.    76.    76.    76.    76.    76.    76.    76.    76.    69.
```

```
LOCATION:   ST. LOUIS, MISSOURI

 MONTH= 7   DAY=21    FOR LATITUDE=      38.6   LONGITUDE=       90.2

ALPHA/H=        .150

                       SOL-AIR TEMPERATURES (DEG. F)


TIME   AIR   SOUTH  SW    WEST   NW    NORTH  NE    EAST   SE    HORIZ
(HR)   TEMP
  1.    81.   81.   81.   81.   81.   81.   81.   81.   81.   74.
  2.    80.   80.   80.   80.   80.   80.   80.   80.   80.   73.
  3.    79.   79.   79.   79.   79.   79.   79.   79.   79.   72.
  4.    78.   78.   78.   78.   78.   78.   78.   78.   78.   71.
  5.    78.   78.   78.   78.   78.   78.   78.   78.   78.   71.
  6.    79.   81.   81.   81.   81.   86.   96.   97.   89.   77.
  7.    80.   84.   84.   84.   84.   89.  107.  112.  101.   88.
  8.    81.   89.   88.   88.   88.   88.  109.  118.  109.   99.
  9.    84.   97.   92.   92.   92.   92.  107.  119.  114.  110.
 10.    86.  105.   96.   96.   96.   96.  104.  116.  117.  118.
 11.    88.  111.  100.   99.   99.   99.   99.  110.  116.  125.
 12.    90.  115.  110.  102.  102.  102.  102.  103.  112.  128.
 13.    93.  116.  119.  113.  104.  104.  104.  104.  106.  130.
 14.    94.  115.  124.  123.  110.  105.  105.  105.  105.  128.
 15.    95.  111.  127.  130.  118.  104.  104.  104.  104.  123.
 16.    96.  105.  125.  132.  123.  103.  103.  103.  103.  116.
 17.    96.  101.  119.  130.  124.  104.  101.  101.  101.  107.
 18.    95.   98.  109.  119.  116.  104.   98.   98.   98.   97.
 19.    94.   94.   95.   95.   95.   95.   94.   94.   94.   87.
 20.    93.   93.   93.   93.   93.   93.   93.   93.   93.   86.
 21.    90.   90.   90.   90.   90.   90.   90.   90.   90.   83.
 22.    88.   88.   88.   88.   88.   88.   88.   88.   88.   81.
 23.    86.   86.   86.   86.   86.   86.   86.   86.   86.   79.
 24.    84.   84.   84.   84.   84.   84.   84.   84.   84.   77.
```

```
LOCATION:   ST. LOUIS, MISSOURI

 MONTH= 7   DAY=21    FOR LATITUDE=     38.6   LONGITUDE=      90.2

ALPHA/H=       .300

                        SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR   SOUTH   SW    WEST    NW    NORTH   NE    EAST    SE    HORIZ
(HR)    TEMP
   1.    81.    81.    81.    81.    81.    81.    81.    81.    81.    74.
   2.    80.    80.    80.    80.    80.    80.    80.    80.    80.    73.
   3.    79.    79.    79.    79.    79.    79.    79.    79.    79.    72.
   4.    78.    78.    78.    78.    78.    78.    78.    78.    78.    71.
   5.    78.    78.    78.    78.    78.    78.    78.    78.    78.    71.
   6.    79.    83.    83.    83.    83.    93.   114.   116.    99.    83.
   7.    80.    89.    89.    89.    89.    97.   134.   144.   122.   104.
   8.    81.    96.    95.    95.    95.    95.   137.   154.   137.   124.
   9.    84.   111.   101.   101.   101.   101.   131.   154.   145.   143.
  10.    86.   124.   106.   106.   106.   106.   121.   146.   147.   157.
  11.    88.   134.   112.   110.   110.   110.   110.   133.   143.   168.
  12.    90.   140.   130.   114.   114.   114.   114.   116.   134.   173.
  13.    93.   140.   145.   133.   115.   115.   115.   115.   120.   174.
  14.    94.   135.   155.   151.   127.   115.   115.   115.   115.   168.
  15.    95.   126.   158.   164.   141.   114.   114.   114.   114.   158.
  16.    96.   113.   154.   169.   150.   111.   111.   111.   111.   143.
  17.    96.   106.   142.   164.   151.   113.   106.   106.   106.   125.
  18.    95.   101.   122.   142.   137.   112.   101.   101.   101.   105.
  19.    94.    94.    95.    96.    96.    95.    94.    94.    94.    87.
  20.    93.    93.    93.    93.    93.    93.    93.    93.    93.    86.
  21.    90.    90.    90.    90.    90.    90.    90.    90.    90.    83.
  22.    88.    88.    88.    88.    88.    88.    88.    88.    88.    81.
  23.    86.    86.    86.    86.    86.    86.    86.    86.    86.    79.
  24.    84.    84.    84.    84.    84.    84.    84.    84.    84.    77.
```

```
LOCATION:   JERSEY CITY, NEW JERSEY

 MONTH= 7   DAY=21    FOR LATITUDE=     40.7   LONGITUDE=      74.2

ALPHA/H=       .150

                        SOL-AIR TEMPERATURES (DEG. F)


TIME   AIR  SOUTH   SW    WEST    NW   NORTH   NE    EAST    SE    HORIZ
(HR)   TEMP
  1.   76.   76.   76.   76.   76.   76.   76.   76.   76.   69.
  2.   74.   74.   74.   74.   74.   74.   74.   74.   74.   67.
  3.   73.   73.   73.   73.   73.   73.   73.   73.   73.   66.
  4.   72.   72.   72.   72.   72.   72.   72.   72.   72.   65.
  5.   72.   72.   72.   72.   72.   72.   72.   72.   72.   65.
  6.   73.   75.   75.   75.   75.   81.   92.   94.   85.   73.
  7.   74.   79.   79.   79.   79.   82.  101.  107.   96.   84.
  8.   76.   84.   83.   83.   83.   83.  103.  112.  105.   94.
  9.   78.   93.   87.   87.   87.   87.  101.  113.  110.  104.
 10.   81.  101.   91.   91.   91.   91.   97.  110.  112.  113.
 11.   83.  108.   96.   94.   94.   94.   94.  105.  111.  119.
 12.   86.  112.  107.   97.   97.   97.   97.   98.  108.  123.
 13.   88.  113.  116.  109.   99.   99.   99.   99.  102.  124.
 14.   90.  111.  121.  119.  106.  100.  100.  100.  100.  123.
 15.   91.  107.  123.  126.  113.  100.  100.  100.  100.  118.
 16.   92.  101.  121.  128.  119.   99.   99.   99.   99.  111.
 17.   92.   97.  115.  126.  119.  100.   97.   97.   97.  102.
 18.   91.   94.  104.  114.  112.  100.   94.   94.   94.   92.
 19.   90.   90.   90.   91.   91.   90.   90.   90.   90.   83.
 20.   88.   88.   88.   88.   88.   88.   88.   88.   88.   81.
 21.   86.   86.   86.   86.   86.   86.   86.   86.   86.   79.
 22.   83.   83.   83.   83.   83.   83.   83.   83.   83.   76.
 23.   81.   81.   81.   81.   81.   81.   81.   81.   81.   74.
 24.   78.   78.   78.   78.   78.   78.   78.   78.   78.   71.
```

```
LOCATION:    JERSEY CITY, NEW JERSEY

 MONTH= 7    DAY=21     FOR LATITUDE=      40.7    LONGITUDE=       74.2

ALPHA/H=        .300

                        SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR   SOUTH   SW    WEST    NW    NORTH   NE    EAST    SE    HORIZ
(HR)    TEMP
   1.    76.    76.    76.    76.    76.    76.    76.    76.    76.    69.
   2.    74.    74.    74.    74.    74.    74.    74.    74.    74.    67.
   3.    73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
   4.    72.    72.    72.    72.    72.    72.    72.    72.    72.    65.
   5.    72.    72.    72.    72.    72.    72.    72.    72.    72.    65.
   6.    73.    78.    78.    78.    78.    88.   112.   115.    96.    80.
   7.    74.    84.    84.    84.    84.    91.   128.   140.   119.   100.
   8.    76.    92.    90.    90.    90.    90.   130.   149.   133.   120.
   9.    78.   108.    96.    96.    96.    96.   123.   148.   141.   138.
  10.    81.   122.   101.   101.   101.   101.   113.   140.   143.   152.
  11.    83.   132.   110.   105.   105.   105.   105.   126.   139.   162.
  12.    86.   137.   128.   109.   109.   109.   109.   110.   130.   168.
  13.    88.   138.   143.   129.   110.   110.   110.   110.   116.   168.
  14.    90.   132.   152.   148.   121.   111.   111.   111.   111.   162.
  15.    91.   123.   155.   160.   136.   109.   109.   109.   109.   152.
  16.    92.   110.   150.   165.   145.   106.   106.   106.   106.   138.
  17.    92.   102.   138.   159.   147.   108.   102.   102.   102.   120.
  18.    91.    97.   117.   137.   133.   108.    97.    97.    97.   100.
  19.    90.    90.    91.    92.    92.    91.    90.    90.    90.    83.
  20.    88.    88.    88.    88.    88.    88.    88.    88.    88.    81.
  21.    86.    86.    86.    86.    86.    86.    86.    86.    86.    79.
  22.    83.    83.    83.    83.    83.    83.    83.    83.    83.    76.
  23.    81.    81.    81.    81.    81.    81.    81.    81.    81.    74.
  24.    78.    78.    78.    78.    78.    78.    78.    78.    78.    71.
```

```
LOCATION:    MEMPHIS, TENNESSEE

 MONTH= 7    DAY=21     FOR LATITUDE=      35.1    LONGITUDE=      90.0

ALPHA/H=        .150

                              SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR   SOUTH   SW    WEST     NW    NORTH   NE    EAST     SE    HORIZ
(HR)    TEMP
   1.    81.    81.    81.    81.    81.    81.    81.    81.    81.    74.
   2.    79.    79.    79.    79.    79.    79.    79.    79.    79.    72.
   3.    78.    78.    78.    78.    78.    78.    78.    78.    78.    71.
   4.    77.    77.    77.    77.    77.    77.    77.    77.    77.    70.
   5.    77.    77.    77.    77.    77.    77.    77.    77.    77.    70.
   6.    78.    80.    80.    80.    80.    84.    94.    95.    87.    76.
   7.    79.    84.    84.    84.    84.    88.   106.   111.   100.    87.
   8.    81.    88.    88.    88.    88.    89.   109.   117.   108.    99.
   9.    83.    96.    92.    92.    92.    92.   109.   119.   113.   110.
  10.    86.   104.    96.    96.    96.    96.   105.   116.   116.   119.
  11.    89.   110.   100.   100.   100.   100.   101.   111.   115.   126.
  12.    92.   114.   110.   103.   103.   103.   103.   104.   112.   130.
  13.    94.   115.   119.   114.   105.   105.   105.   105.   106.   132.
  14.    96.   114.   125.   125.   114.   107.   107.   107.   107.   130.
  15.    97.   111.   127.   132.   121.   106.   106.   106.   106.   125.
  16.    98.   105.   126.   135.   126.   105.   105.   105.   105.   118.
  17.    98.   103.   120.   131.   126.   107.   103.   103.   103.   108.
  18.    97.   100.   109.   119.   117.   105.   100.   100.   100.    98.
  19.    96.    96.    96.    96.    96.    96.    96.    96.    96.    89.
  20.    94.    94.    94.    94.    94.    94.    94.    94.    94.    87.
  21.    92.    92.    92.    92.    92.    92.    92.    92.    92.    85.
  22.    89.    89.    89.    89.    89.    89.    89.    89.    89.    82.
  23.    86.    86.    86.    86.    86.    86.    86.    86.    86.    79.
  24.    83.    83.    83.    83.    83.    83.    83.    83.    83.    76.
```

```
LOCATION:     MEMPHIS, TENNESSEE

 MONTH= 7     DAY=21      FOR LATITUDE=       35.1    LONGITUDE=        90.0

ALPHA/H=        .300

                          SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR   SOUTH   SW     WEST    NW     NORTH   NE     EAST    SE     HORIZ
(HR)    TEMP
   1.   81.    81.    61.    81.    81.    81.    81.    81.    81.     74.
   2.   79.    79.    79.    79.    79.    79.    79.    79.    79.     72.
   3.   78.    78.    78.    78.    78.    78.    78.    78.    78.     71.
   4.   77.    77.    77.    77.    77.    77.    77.    77.    77.     70.
   5.   77.    77.    77.    77.    77.    77.    77.    77.    77.     70.
   6.   78.    82.    82.    82.    82.    91.   110.   112.    96.     81.
   7.   79.    88.    86.    88.    88.    98.   133.   143.   120.    103.
   8.   81.    95.    95.    95.    95.    97.   138.   154.   135.    124.
   9.   83.   108.   101.   101.   101.   101.   134.   154.   143.    143.
  10.   86.   121.   107.   107.   107.   107.   125.   147.   145.    159.
  11.   89.   131.   112.   112.   112.   112.   114.   134.   141.    170.
  12.   92.   136.   129.   115.   115.   115.   115.   117.   132.    176.
  13.   94.   137.   144.   135.   117.   117.   117.   117.   118.    177.
  14.   96.   133.   154.   153.   132.   117.   117.   117.   117.    171.
  15.   97.   124.   157.   166.   145.   116.   116.   116.   116.    160.
  16.   98.   113.   154.   171.   154.   113.   113.   113.   113.    145.
  17.   98.   108.   142.   165.   154.   116.   108.   108.   108.    126.
  18.   97.   102.   122.   140.   137.   113.   102.   102.   102.    105.
  19.   96.    96.    96.    96.    96.    96.    96.    96.    96.     89.
  20.   94.    94.    94.    94.    94.    94.    94.    94.    94.     87.
  21.   92.    92.    92.    92.    92.    92.    92.    92.    92.     85.
  22.   89.    89.    69.    89.    89.    89.    89.    89.    89.     82.
  23.   86.    86.    86.    86.    86.    86.    86.    86.    86.     79.
  24.   83.    83.    83.    83.    83.    83.    83.    83.    83.     76.
```

```
LOCATION:    HOUSTON, TEXAS

 MONTH= 7    DAY=21     FOR LATITUDE=      29.6  LONGITUDE=      95.3

ALPHA/H=         .300

                              SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR  SOUTH  SW    WEST    NW    NORTH  NE    EAST    SE    HORIZ
(HR)    TEMP
   1.    81.    81.    81.    81.    81.    81.    81.    81.    81.    74.
   2.    80.    80.    80.    80.    80.    80.    80.    80.    80.    73.
   3.    79.    79.    79.    79.    79.    79.    79.    79.    79.    72.
   4.    78.    78.    78.    78.    78.    78.    78.    78.    78.    71.
   5.    78.    78.    78.    78.    78.    78.    78.    78.    78.    71.
   6.    79.    79.    79.    79.    79.    82.    85.    85.    82.    73.
   7.    80.    87.    87.    87.    87.    99.   128.   133.   111.    94.
   8.    81.    93.    93.    93.    93.   102.   140.   152.   129.   117.
   9.    84.   100.   100.   100.   100.   101.   140.   156.   139.   138.
  10.    86.   111.   106.   106.   106.   106.   134.   151.   142.   156.
  11.    88.   121.   111.   111.   111.   111.   124.   140.   139.   169.
  12.    90.   128.   117.   114.   114.   114.   114.   124.   130.   177.
  13.    93.   130.   134.   127.   116.   116.   116.   116.   118.   179.
  14.    94.   127.   145.   147.   131.   117.   117.   117.   117.   174.
  15.    95.   120.   151.   161.   144.   115.   115.   115.   115.   164.
  16.    96.   112.   151.   169.   153.   114.   112.   112.   112.   149.
  17.    96.   108.   143.   166.   155.   116.   108.   108.   108.   130.
  18.    95.   102.   125.   146.   142.   114.   102.   102.   102.   108.
  19.    94.    94.    95.    97.    97.    95.    94.    94.    94.    88.
  20.    93.    93.    93.    93.    93.    93.    93.    93.    93.    86.
  21.    90.    90.    90.    90.    90.    90.    90.    90.    90.    83.
  22.    88.    88.    88.    88.    88.    88.    88.    88.    88.    81.
  23.    86.    86.    86.    86.    86.    86.    86.    86.    86.    79.
  24.    84.    84.    84.    84.    84.    84.    84.    84.    84.    77.
```

```
LOCATION:    HOUSTON, TEXAS

 MONTH= 7    DAY=21     FOR LATITUDE=      29.6   LONGITUDE=      95.3

ALPHA/H=          .150

                                   SOL-AIR TEMPERATURES (DEG. F)


TIME     AIR   SOUTH   SW     WEST     NW    NORTH   NE     EAST     SE     HORIZ
(HR)     TEMP
   1.     81.     81.    81.     81.     81.    81.     81.    81.     81.     74.
   2.     80.     80.    80.     80.     80.    80.     80.    80.     80.     73.
   3.     79.     79.    79.     79.     79.    79.     79.    79.     79.     72.
   4.     78.     78.    78.     78.     78.    78.     78.    78.     78.     71.
   5.     78.     78.    78.     78.     78.    78.     78.    78.     78.     71.
   6.     79.     79.    79.     79.     79.    80.     82.    82.     80.     72.
   7.     80.     83.    83.     83.     83.    89.    104.   107.     96.     83.
   8.     81.     87.    87.     87.     87.    92.    111.   117.    105.     96.
   9.     84.     92.    92.     92.     92.    92.    112.   120.    111.    107.
  10.     86.     99.    96.     96.     96.    96.    110.   118.    114.    117.
  11.     88.    105.    99.     99.     99.    99.    106.   114.    113.    125.
  12.     90.    109.   104.    102.    102.   102.    102.   107.    110.    130.
  13.     93.    111.   113.    110.    104.   104.    104.   104.    105.    132.
  14.     94.    111.   120.    121.    112.   105.    105.   105.    105.    131.
  15.     95.    108.   123.    128.    120.   105.    105.   105.    105.    126.
  16.     96.    104.   123.    132.    125.   105.    104.   104.    104.    119.
  17.     96.    102.   119.    131.    125.   106.    102.   102.    102.    109.
  18.     95.     99.   110.    121.    118.   104.     99.    99.     99.     98.
  19.     94.     94.    95.     95.     95.    95.     94.    94.     94.     87.
  20.     93.     93.    93.     93.     93.    93.     93.    93.     93.     86.
  21.     90.     90.    90.     90.     90.    90.     90.    90.     90.     83.
  22.     88.     88.    88.     88.     88.    88.     88.    88.     88.     81.
  23.     86.     86.    86.     86.     86.    86.     86.    86.     86.     79.
  24.     84.     84.    84.     84.     84.    84.     84.    84.     84.     77.
```

```
LOCATION:   SEATTLE, WASHINGTON (CITY)

 MONTH= 7   DAY=21     FOR LATITUDE=      47.6   LONGITUDE=    122.3

ALPHA/H=       .150

                            SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR  SOUTH   SW    WEST    NW    NORTH   NE    EAST    SE    HORIZ
(HR)    TEMP
   1.    66.    66.    66.    66.    66.    66.    66.    66.    66.    59.
   2.    64.    64.    64.    64.    64.    64.    64.    64.    64.    57.
   3.    63.    63.    63.    63.    63.    63.    63.    63.    63.    56.
   4.    62.    62.    62.    62.    62.    62.    62.    62.    62.    55.
   5.    62.    62.    62.    62.    62.    63.    63.    63.    62.    55.
   6.    63.    65.    65.    65.    65.    71.    82.    83.    74.    62.
   7.    64.    69.    69.    69.    69.    72.    90.    96.    86.    72.
   8.    66.    75.    72.    72.    72.    72.    91.   102.    95.    82.
   9.    68.    84.    76.    76.    76.    76.    89.   103.   101.    91.
  10.    70.    93.    80.    80.    80.    80.    85.   100.   104.   100.
  11.    73.   100.    86.    83.    83.    83.    83.    95.   104.   106.
  12.    75.   105.    97.    86.    86.    86.    86.    89.   101.   110.
  13.    77.   106.   106.    95.    88.    88.    88.    88.    96.   112.
  14.    79.   105.   112.   106.    90.    89.    89.    89.    89.   111.
  15.    80.   100.   114.   113.    98.    89.    89.    89.    89.   107.
  16.    81.    94.   113.   117.   105.    88.    88.    88.    88.   101.
  17.    81.    87.   107.   116.   108.    87.    87.    87.    87.    94.
  18.    80.    84.    98.   108.   104.    89.    84.    84.    84.    85.
  19.    79.    80.    85.    90.    90.    84.    80.    80.    80.    75.
  20.    77.    77.    77.    77.    77.    77.    77.    77.    77.    70.
  21.    75.    75.    75.    75.    75.    75.    75.    75.    75.    68.
  22.    73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
  23.    70.    70.    70.    70.    70.    70.    70.    70.    70.    63.
  24.    68.    68.    68.    68.    68.    68.    68.    68.    68.    61.
```

```
LOCATION:    SEATTLE, WASHINGTON (AIRPORT)

 MONTH= 7    DAY=21     FOR LATITUDE=      47.4    LONGITUDE=      122.3

ALPHA/H=         .300

                          SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR   SOUTH   SW     WEST    NW     NORTH   NE     EAST    SE     HORIZ
(HR)    TEMP
   1.    67.    67.    67.    67.    67.    67.    67.    67.    67.    60.
   2.    65.    65.    65.    65.    65.    65.    65.    65.    65.    58.
   3.    64.    64.    64.    64.    64.    64.    64.    64.    64.    57.
   4.    63.    63.    63.    63.    63.    63.    63.    63.    63.    56.
   5.    63.    63.    63.    63.    63.    64.    65.    65.    64.    56.
   6.    64.    69.    69.    69.    69.    80.   102.   105.    87.    70.
   7.    65.    74.    74.    74.    74.    80.   118.   129.   109.    89.
   8.    67.    85.    80.    80.    80.    80.   119.   139.   125.   107.
   9.    70.   103.    86.    86.    86.    86.   112.   140.   136.   124.
  10.    73.   118.    91.    91.    91.    91.   102.   133.   140.   138.
  11.    75.   130.   103.    96.    96.    96.    96.   121.   138.   149.
  12.    78.   137.   122.   100.   100.   100.   100.   105.   130.   155.
  13.    81.   138.   138.   117.   102.   102.   102.   102.   117.   156.
  14.    83.   134.   148.   136.   104.   103.   103.   103.   103.   153.
  15.    84.   124.   152.   150.   120.   102.   102.   102.   102.   145.
  16.    85.   111.   148.   157.   132.   100.   100.   100.   100.   133.
  17.    85.    96.   137.   155.   138.    97.    96.    96.    96.   117.
  18.    84.    91.   119.   140.   132.   101.    91.    91.    91.   100.
  19.    83.    85.    94.   105.   105.    93.    85.    85.    85.    82.
  20.    81.    81.    81.    81.    81.    81.    81.    81.    81.    74.
  21.    78.    78.    78.    78.    78.    78.    78.    78.    78.    71.
  22.    75.    75.    75.    75.    75.    75.    75.    75.    75.    68.
  23.    73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
  24.    70.    70.    70.    70.    70.    70.    70.    70.    70.    63.
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LOCATION:   SEATTLE, WASHINGTON (AIRPORT)

 MONTH= 7   DAY=21    FOR LATITUDE=     47.4   LONGITUDE=    122.3

ALPHA/H=       .150

                        SOL-AIR TEMPERATURFS (DEG. F)


TIME   AIR  SOUTH  SW   WEST   NW   NORTH  NE   EAST   SE   HORIZ
(HR)   TEMP
   1.   67.   67.   67.   67.   67.   67.   67.   67.   67.   60.
   2.   65.   65.   65.   65.   65.   65.   65.   65.   65.   58.
   3.   64.   64.   64.   64.   64.   64.   64.   64.   64.   57.
   4.   63.   63.   63.   63.   63.   63.   63.   63.   63.   56.
   5.   63.   63.   63.   63.   63.   63.   64.   64.   63.   56.
   6.   64.   66.   66.   66.   66.   72.   83.   84.   75.   64.
   7.   65.   70.   70.   70.   70.   73.   91.   97.   87.   74.
   8.   67.   76.   74.   74.   74.   74.   93.  103.   96.   84.
   9.   70.   86.   78.   78.   78.   78.   91.  105.  103.   93.
  10.   73.   95.   82.   82.   82.   82.   87.  103.  106.  102.
  11.   75.  103.   89.   86.   86.   86.   86.   98.  107.  109.
  12.   78.  108.  100.   89.   89.   89.   89.   92.  104.  113.
  13.   81.  109.  109.   99.   91.   91.   91.   91.   99.  115.
  14.   83.  108.  115.  109.   94.   93.   93.   93.   93.  114.
  15.   84.  104.  118.  117.  102.   93.   93.   93.   93.  111.
  16.   85.   98.  117.  121.  109.   92.   92.   92.   92.  105.
  17.   85.   91.  111.  120.  112.   91.   91.   91.   91.   98.
  18.   84.   88.  101.  112.  108.   93.   88.   88.   88.   88.
  19.   83.   84.   88.   94.   94.   88.   84.   84.   84.   79.
  20.   81.   81.   81.   81.   81.   81.   81.   81.   81.   74.
  21.   78.   78.   78.   78.   78.   78.   78.   78.   78.   71.
  22.   75.   75.   75.   75.   75.   75.   75.   75.   75.   68.
  23.   73.   73.   73.   73.   73.   73.   73.   73.   73.   66.
  24.   70.   70.   70.   70.   70.   70.   70.   70.   70.   63.
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LOCATION:   SEATTLE, WASHINGTON (CITY)

 MONTH= 7    DAY=21     FOR LATITUDE=      47.6    LONGITUDE=     122.3

ALPHA/H=        .300

                        SOL-AIR TEMPERATURES (DEG. F)


TIME    AIR   SOUTH   SW     WEST     NW     NORTH   NE     EAST     SE     HORIZ
(HR)    TEMP
   1.    66.    66.    66.    66.    66.    66.    66.    66.    66.    59.
   2.    64.    64.    64.    64.    64.    64.    64.    64.    64.    57.
   3.    63.    63.    63.    63.    63.    63.    63.    63.    63.    56.
   4.    62.    62.    62.    62.    62.    62.    62.    62.    62.    55.
   5.    62.    62.    62.    62.    62.    63.    64.    64.    63.    55.
   6.    63.    68.    68.    68.    68.    78.   101.   104.    86.    69.
   7.    64.    73.    73.    73.    73.    79.   116.   128.   108.    88.
   8.    66.    84.    79.    79.    79.    79.   117.   138.   124.   106.
   9.    68.   101.    84.    84.    84.    84.   110.   138.   134.   122.
  10.    70.   116.    89.    89.    89.    89.    99.   131.   138.   136.
  11.    73.   128.   100.    93.    93.    93.    93.   118.   135.   146.
  12.    75.   134.   119.    97.    97.    97.    97.   102.   127.   152.
  13.    77.   135.   135.   113.    99.    99.    99.    99.   114.   153.
  14.    79.   130.   145.   132.   100.    99.    99.    99.    99.   149.
  15.    80.   120.   148.   146.   116.    98.    98.    98.    98.   141.
  16.    81.   107.   144.   153.   128.    96.    96.    96.    96.   129.
  17.    81.    92.   133.   151.   134.    93.    92.    92.    92.   113.
  18.    80.    88.   115.   136.   129.    97.    88.    88.    88.    96.
  19.    79.    82.    90.   102.   102.    90.    82.    82.    82.    78.
  20.    77.    77.    77.    77.    77.    77.    77.    77.    77.    70.
  21.    75.    75.    75.    75.    75.    75.    75.    75.    75.    68.
  22.    73.    73.    73.    73.    73.    73.    73.    73.    73.    66.
  23.    70.    70.    70.    70.    70.    70.    70.    70.    70.    63.
  24.    68.    68.    68.    68.    68.    68.    68.    68.    68.    61.
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Table D

Magnetic Tape TDF 14 for Breakthrough Localities

Localities	Station No.	Record Period	Reel No.
Sacramento, Calif.	23232	Jan. '49 - Dec. '58	069
Wilmington, Del. (Phila., Pa.)	13739	Jan. '49 - Dec. '58	268
Macon, Ga.	03813	Jan. '55 - Dec. '64	527
Indianapolis, Ind.	93819	Jan. '49 - Dec. '58	550
Kalamazoo, Mich. (Battle Creek)	14815	Jan. '49 - Dec. '54	073
St. Louis, Mo.	13984	Jan. '49 - Dec. '58	261
Jersey City, N. J. (Newark, N. J.)	14734	Jan. '49 - Dec. '58	205
Memphis Tennessee	93839	Jan. '49 - Dec. '58	173
Houston, Tex.	12918	Jan. '49 - Dec. '58	259
Seattle, Wash. Sea/Tac airport	24233	Jan. '49 - Dec. '58	088
Downtown Seattle	24244		302, 86, 326

Table E

AFM 88-8* Data for Coincident Dry- and Wet-Bulb Temperature Frequencies

These tables show the frequency of the hourly dry-bulb temperature observations for a temperature range of 5 degrees F for three daily time periods; from 02 to 09 hours, from 10 to 17 hours and from 18 to 01 hours. Also listed are total frequencies of hourly observations for each month at 5 ° temperature "bin" and average wet-bulb temperature that occurs coincident with the same temperature level specified in the "bin".

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* Amended by O. E. Richard in 1971

SACRAMENTO, CALIFORNIA

Mean Frequency of Occurrence of Dry Bulb Temperature (°F) With Mean Coincident Wet Bulb Temperature (°F) For Each Dry Bulb Temperature Range

COOLING SEASON

Temperature Range (°F)	May					June					July					August					September					October				
	Obsn/ Hour Gp 02 to 09	Obsn/ Hour Gp 10 to 17	Obsn/ Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp 02 to 09	Obsn/ Hour Gp 10 to 17	Obsn/ Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp 02 to 09	Obsn/ Hour Gp 10 to 17	Obsn/ Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp 02 to 09	Obsn/ Hour Gp 10 to 17	Obsn/ Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp 02 to 09	Obsn/ Hour Gp 10 to 17	Obsn/ Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp 02 to 09	Obsn/ Hour Gp 10 to 17	Obsn/ Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)
115/119	0	0	0	0	0	0	0	0	0	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110/114	0	0	0	0	0	0	1	0	1	73	0	1	0	1	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105/109	0	0	0	0	0	0	3	0	3	73	0	3	0	3	72	0	0	0	0	0	0	1	0	1	68	0	0	0	0	0
100/104	0	0	0	0	0	0	10	1	11	71	0	11	1	12	70	0	11	0	11	70	0	4	0	4	70	0	0	0	0	0
95/99	0	1	0	1	65	0	15	3	18	70	0	29	3	32	69	0	28	3	31	69	0	10	1	11	68	0	1	0	1	68
90/94	0	6	1	7	66	0	25	5	30	68	0	47	8	55	68	0	52	7	59	68	0	35	3	38	67	0	8	0	8	66
85/89	0	16	2	18	64	2	36	7	45	66	1	50	11	62	67	0	55	12	67	67	0	42	7	49	64	0	17	1	18	64
80/84	0	35	5	40	63	4	49	14	67	64	4	44	20	68	65	3	48	20	71	65	1	49	14	64	63	0	29	4	33	63
75/79	2	40	10	52	61	7	42	21	70	62	8	28	26	62	63	10	33	29	72	63	5	48	24	77	62	0	45	8	53	61
70/74	5	53	14	72	59	23	28	32	83	60	26	14	38	78	61	24	17	46	87	61	14	33	37	84	60	3	56	19	78	59
65/69	14	43	25	82	57	35	9	38	82	58	42	2	51	95	59	50	3	55	108	59	35	15	54	104	58	12	51	37	100	57
60/64	34	25	46	105	55	49	2	52	103	56	67	0	47	114	56	71	1	54	126	57	68	3	58	129	56	37	28	69	134	55
55/59	57	8	66	131	52	60	1	34	95	53	64	0	20	84	54	76	0	22	98	54	76	0	36	112	54	82	11	77	170	53
50/54	75	2	47	124	49	38	1	12	51	50	14	0	1	15	51	14	0	0	14	51	38	0	6	44	50	85	2	27	114	49
45/49	32	0	9	41	45	1	0	0	1	46	0	0	0	0	0	0	0	0	0	0	3	0	0	3	47	22	0	4	26	44
40/44	6	0	1	7	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	2	8	39
35/39	1	0	0	1	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	36
30/34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25/29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HEATING SEASON

Temperature Range (°F)	November					December					January					February					March					April					Annual (Total - All Months)				
	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)
115/119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72
110/114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	74
105/109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	1	8	72
100/104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	3	38	71
95/99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	82	10	92	69
90/94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	64	1	172	24	197	68
85/89	0	0	0	0	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	63	3	219	41	263	66
80/84	0	1	0	1	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	61	0	19	2	21	62	12	275	78	365	64
75/79	0	7	0	7	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	0	7	0	7	58	0	36	6	42	59	32	286	124	442	62
70/74	0	16	1	17	57	0	0	0	0	53	0	0	0	0	0	0	2	0	2	57	0	23	3	26	56	1	46	12	59	58	96	288	202	586	60
65/69	0	34	4	38	55	0	5	0	5	52	0	1	0	1	55	0	11	1	12	57	0	34	7	41	53	5	48	20	73	55	193	257	291	741	57
60/64	2	57	17	76	53	2	20	4	26	54	0	10	1	11	55	1	46	8	55	53	2	66	18	86	52	15	39	34	88	53	346	297	409	1052	55
55/59	14	61	46	121	51	9	48	17	74	52	4	33	11	48	52	14	80	38	132	52	16	71	47	134	50	41	28	50	119	51	511	341	463	1315	52
50/54	54	41	77	172	48	19	62	39	120	48	19	68	32	119	48	47	56	70	173	49	52	37	79	168	48	62	15	63	140	48	516	282	452	1250	49
45/49	62	18	57	137	44	41	59	67	167	44	41	65	67	173	45	49	24	59	132	44	76	8	63	147	44	77	5	42	124	45	402	178	367	947	44
40/44	63	5	31	99	40	75	40	76	191	41	49	46	71	166	40	57	6	39	102	40	74	1	28	103	40	32	0	11	43	40	361	98	259	718	40
35/39	40	0	7	47	35	68	13	38	119	36	75	17	45	137	36	45	1	10	56	35	25	0	3	28	36	7	0	0	7	36	262	32	103	397	36
30/34	4	0	0	4	31	28	1	6	35	32	48	7	20	75	31	12	0	1	13	30	3	0	0	3	32	0	0	0	0	34	96	8	28	132	31
25/29	1	0	0	1	25	6	0	1	7	28	12	0	1	13	26	1	0	0	1	25	0	0	0	0	0	0	0	0	0	0	19	1	2	22	27
20/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22

* WILLMINGTON DELAWARE

Mean Frequency of Occurrence of Dry Bulb Temperature (°F) With Mean Coincident Wet Bulb Temperature (°F) For Each Dry Bulb Temperature Range

COOLING SEASON

Temperature Range (°F)	MAY					JUNE					JULY				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
100/104												1		1	74
95/99							1	0	1	78		7	0	7	74
90/94		3		3	71	0	12	1	13	74	0	22	2	24	74
85/89		10	1	11	70	1	39	3	43	72	3	58	9	70	73
80/84	1	20	3	24	68	6	54	17	77	69	12	81	30	123	70
75/79	4	35	10	49	65	19	52	37	108	67	44	53	69	166	69
70/74	12	49	23	84	62	49	43	56	148	65	87	23	82	192	68
65/69	31	54	42	127	60	64	25	62	151	62	61	3	43	107	64
60/64	50	39	60	149	56	54	9	43	106	58	33	0	12	45	59
55/59	57	23	50	130	52	34	3	16	53	54	8		1	9	55
50/54	49	13	37	99	48	12	2	5	19	50	0			0	50
45/49	30	2	18	50	44	1			1	45					
40/44	11		4	15	39										
35/39	3		0	3	35										
30/34															

Temperature Range (°F)	AUGUST					SEPTEMBER					OCTOBER				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
100/104		1		1	78		0		0	79					
95/99	0	3		3	74		1		1	79					
90/94	0	13	0	13	75		5	0	5	75					
85/89	1	47	4	52	73	0	21	1	22	74		2		2	71
80/84	7	68	20	95	71	2	39	6	47	72	0	9		9	71
75/79	32	72	60	164	69	13	49	28	90	69	1	19	3	23	66
70/74	84	35	90	209	68	40	50	49	139	66	6	33	10	49	64
65/69	74	8	54	136	64	57	47	59	163	62	14	53	20	87	60
60/64	33	1	17	51	60	43	22	48	108	58	30	48	43	121	57
55/59	16		3	19	55	38	6	31	75	53	43	43	52	138	53
50/54	1			1	51	28	0	17	45	49	51	28	55	134	48
45/49						13		5	18	45	49	10	36	95	44
40/44						5		1	6	40	32	3	20	55	39
35/39						1			1	36	18	0	7	25	35
30/34											4		2	6	31

HEATING SEASON

Temperature Range (°F)	NOVEMBER					DECEMBER					JANUARY					FEBRUARY					MARCH					APRIL					ANNUAL (TOTAL—ALL MONTHS)				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
100/104																																2		2	74
95/99																															0	13	0	13	75
90/94																															0	54	3	57	74
85/89																											3		3	68	6	180	18	204	72
80/84		0		0	68																					0	9	0	9	65	28	281	75	384	69
75/79		0		0	66																	1		1	59	0	16	3	19	63	113	299	209	621	66
70/74		5		5	63												1		1	59		4	0	4	57	3	20	7	30	60	279	264	317	860	63
65/69	2	12	1	15	59		1	0	1	59			0	0	62		2	0	2	59	0	6	1	7	55	7	25	11	43	57	311	232	294	837	60
60/64	6	25	8	39	57	0	3	1	4	53	1	0	0	1	58	0	3	1	4	55	1	15	3	19	52	18	31	27	76	55	270	197	259	276	57
55/59	19	36	22	77	53	2	10	3	15	51	1	4	0	5	52	2	8	1	11	51	5	23	10	38	49	31	50	36	117	51	255	204	225	684	52
50/54	21	45	26	92	47	6	21	7	34	47	2	8	2	12	48	5	20	6	31	46	9	36	17	62	45	38	40	47	125	47	222	213	218	653	48
45/49	29	52	45	126	42	16	33	18	67	43	4	21	8	33	43	10	30	17	57	43	23	45	35	103	42	53	29	53	135	43	227	221	236	684	43
40/44	47	39	48	134	38	26	47	37	110	39	15	36	20	71	38	19	46	31	96	38	43	48	57	148	38	45	13	34	92	38	243	232	252	727	39
35/39	49	18	53	120	34	40	47	45	132	34	38	73	52	168	34	44	52	51	147	34	64	41	57	162	34	32	4	18	54	34	288	236	284	808	34
30/34	47	6	28	81	30	55	41	53	149	30	63	50	69	182	29	63	32	64	159	30	52	17	40	109	29	11	0	4	15	30	293	147	256	696	30
25/29	15	2	7	24	25	35	26	39	100	25	48	29	45	122	25	39	18	28	80	25	29	9	19	57	24	2		0	2	25	168	79	138	385	25
20/24	3	0	2	5	20	33	15	29	77	20	32	17	24	73	20	19	9	10	38	20	15	3	8	26	20						104	44	74	222	20
15/19	2		0	2	15	25	3	13	41	15	24	9	16	49	15	11	5	9	25	15	5		1	6	15						67	17	40	124	15
10/14						9	1	3	13	11	12	1	8	21	11	8	2	4	14	11	2			2	11						31	4	15	50	11
5/9						1	0	0	1	6	2	0	3	9	6	3	1	2	6	6											10	1	6	17	6
0/4						0			0	2	2		1	3	2	1			1	1											4		1	5	2
−5/−1											0			0	−3	0			0	−3											1			1	−3

WARNER ROBBINS AFB, GEORGIA (Substitute Station for Macon)

Mean Frequency of Occurrence of Dry Bulb Temperature (°F) With Mean Coincident Wet Bulb Temperature (°F) For Each Dry Bulb Temperature Range

COOLING SEASON

Temperature Range (°F)	May					June					July					August					September					October				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
100/104	0	0	0	0	71	0	2	0	2	76	0	1	0	1	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95/99	0	6	1	7	73	0	12	2	14	75	0	16	2	18	77	0	13	0	13	77	0	3	0	3	76	0	0	0	0	0
90/94	0	30	6	36	72	0	41	10	51	74	0	52	11	63	76	0	66	12	78	76	0	27	2	29	74	0	1	0	1	72
85/89	1	56	16	73	70	2	67	25	94	73	2	86	31	119	75	1	84	33	118	75	0	60	14	74	74	0	14	1	15	70
80/84	4	58	31	93	69	11	60	45	116	72	17	57	54	128	74	11	52	51	114	74	2	61	27	90	71	0	39	4	43	67
75/79	17	46	47	110	67	50	38	66	154	71	80	28	91	199	73	69	27	89	185	72	23	45	64	132	71	2	53	16	71	66
70/74	58	27	64	149	66	105	15	70	190	69	132	6	55	193	70	128	6	59	193	70	93	25	76	194	69	13	51	37	101	64
65/69	79	15	47	141	63	52	3	18	73	65	14	0	2	16	66	36	0	4	40	66	67	12	37	116	64	32	40	52	124	61
60/64	40	7	22	69	58	16	2	3	21	59	1	0	0	1	62	3	0	0	3	61	34	5	15	54	59	53	30	52	135	57
55/59	29	3	11	43	54	3	0	1	4	55	0	0	0	0	0	0	0	0	0	58	15	2	4	21	55	52	15	43	110	53
50/54	15	0	3	18	48	1	0	0	1	49	0	0	0	0	0	0	0	0	0	0	5	0	1	6	50	44	4	26	74	49
45/49	5	0	0	5	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	47	29	0	11	40	45
40/44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	5	19	40
35/39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	1	8	36
30/34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	32
25/29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HEATING SEASON

Temperature Range (°F)	November					December					January					February					March					April					Annual (Total - All Months)				
	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/Hour Gp 02 to 09	Obsn/Hour Gp 10 to 17	Obsn/Hour Gp 18 to 01	Total Obsn	Mean Coincident Wet Bulb (°F)
100/104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	76
95/99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	5	55	76
90/94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	71	0	216	40	256	75
85/89	0	1	0	1	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	0	2	0	2	67	0	13	2	15	68	5	382	122	509	73
80/84	0	7	1	8	68	0	0	0	0	0	0	0	0	0	0	0	2	0	2	66	0	8	1	9	64	0	41	11	52	65	45	384	225	654	71
75/79	0	26	3	29	64	0	3	0	3	65	0	2	0	2	64	0	6	1	7	65	0	22	7	29	63	1	52	25	78	64	242	349	408	999	70
70/74	1	40	14	55	62	2	14	2	18	62	0	11	2	13	61	1	13	6	20	61	2	29	17	48	60	12	49	43	104	62	547	286	444	1277	67
65/69	18	48	32	98	59	2	22	9	33	58	2	18	8	28	59	3	21	15	39	59	10	36	28	74	58	41	36	55	132	60	356	253	306	915	62
60/64	29	46	42	117	56	10	35	20	65	55	8	26	16	50	56	13	28	22	63	56	25	45	45	115	55	61	28	46	135	57	292	253	281	826	57
55/59	34	32	43	109	52	14	43	31	88	51	18	35	26	79	51	15	34	33	82	51	32	39	47	118	51	44	12	29	85	52	257	213	267	737	52
50/54	34	23	39	96	47	26	39	43	108	46	22	39	37	98	47	26	37	35	98	46	48	28	39	115	47	38	7	19	64	48	258	177	242	677	47
45/49	35	11	33	79	43	31	36	38	105	42	29	38	42	109	43	37	35	37	109	42	42	19	27	88	42	24	1	9	34	44	232	140	197	569	42
40/44	42	5	19	66	39	37	31	45	113	38	33	38	41	112	38	39	26	35	100	38	41	13	22	76	38	16	0	1	17	39	221	112	169	502	38
35/39	33	1	11	45	34	46	16	33	95	34	46	22	34	102	34	36	15	22	73	33	28	5	10	43	34	3	0	0	3	36	199	59	110	368	34
30/34	12	0	3	15	30	45	7	19	71	29	43	13	27	83	29	27	6	13	46	29	15	2	5	22	30	0	0	0	0	0	144	28	66	238	29
25/29	2	0	0	2	26	26	1	7	34	25	30	5	10	45	25	20	2	5	27	24	4	0	0	4	25	0	0	0	0	0	81	8	22	111	25
20/24	0	0	0	0	23	7	1	1	9	20	11	1	4	16	19	5	1	1	7	19	1	0	0	1	20	0	0	0	0	0	23	3	6	32	20
15/19	0	0	0	0	0	1	0	0	1	16	4	0	1	5	16	3	0	1	4	14	0	0	0	0	0	0	0	0	0	0	8	1	2	11	15
10/14	0	0	0	0	0	1	0	0	1	11	1	0	0	1	10	1	0	0	1	10	0	0	0	0	0	0	0	0	0	0	3	1	0	4	10
5/9	0	0	0	0	0	0	0	0	0	8	1	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	6

ST. LOUIS, MISSOURI

Mean Frequency of Occurrence of Dry Bulb Temperature (°F) With Mean Coincident Wet Bulb Temperature (°F) For Each Dry Bulb Temperature Range

COOLING SEASON

	May					June					July					August					September					October				
Temperature Range (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to .17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
110/114	0	0	0	0	0	0	0	0	0	0	0	1	0	1	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105/109	0	0	0	0	0	0	0	0	0	0	0	1	0	1	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100/104	0	0	0	0	0	0	2	0	2	74	0	4	1	5	75	0	2	0	2	74	0	3	0	3	68	0	0	0	0	0
95/99	0	0	0	0	72	0	8	1	9	75	0	16	2	18	75	0	16	1	17	74	0	9	0	9	70	0	0	0	0	0
90/94	0	4	0	4	72	1	31	5	37	74	1	43	9	53	75	0	49	8	57	74	0	22	2	24	71	0	1	0	1	70
85/89	0	26	3	29	71	5	48	18	71	72	8	64	31	103	73	6	70	26	102	73	1	33	9	43	70	0	5	0	5	68
80/84	2	38	14	54	68	16	59	39	114	70	28	67	59	154	71	23	61	58	142	71	8	42	25	75	68	0	22	1	23	66
75/79	11	46	29	86	65	40	44	51	135	68	65	34	75	174	70	67	33	71	171	70	25	45	38	108	66	2	34	7	43	64
70/74	30	45	39	114	63	59	25	59	143	66	89	15	50	154	67	75	12	52	139	67	45	44	48	137	64	11	37	22	70	62
65/69	48	36	52	136	60	60	14	40	114	62	39	3	18	60	63	45	4	23	72	63	45	29	51	125	60	21	37	37	95	59
60/64	54	25	45	124	56	35	6	17	58	58	15	0	3	18	59	25	1	8	34	59	44	10	34	88	56	38	38	47	123	55
55/59	39	16	30	85	52	17	3	7	27	54	3	0	0	3	54	6	0	1	7	55	37	2	22	61	52	44	34	41	119	51
50/54	27	8	20	55	47	6	0	3	9	50	0	0	0	0	51	1	0	0	1	52	23	1	9	33	48	40	20	40	100	47
45/49	20	3	10	33	43	1	0	0	1	46	0	0	0	0	0	0	0	0	0	0	10	0	2	12	44	44	10	32	86	43
40/44	14	1	5	20	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	41	31	8	13	52	39
35/39	3	0	1	4	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	2	7	21	35
30/34	0	0	0	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1	5	30
25/29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	27
20/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0/4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-5/-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HEATING SEASON

Temperature Range (°F)	November					December					January				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
110/114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105/109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100/104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95/99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90/94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
85/89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80/84	0	1	0	1	65	0	0	0	0	0	0	0	0	0	0
75/79	0	4	0	4	63	0	0	0	0	0	0	0	0	0	0
70/74	0	12	1	13	59	0	1	0	1	60	0	0	0	0	0
65/69	3	17	7	27	58	0	3	0	3	57	0	0	0	0	60
60/64	8	24	16	48	54	1	8	3	12	53	1	6	3	10	56
55/59	15	28	22	65	49	3	13	6	22	49	3	10	4	17	51
50/54	23	33	33	89	45	9	25	15	49	46	4	13	6	23	46
45/49	32	34	34	100	42	12	26	18	56	41	5	18	12	35	42
40/44	42	37	38	117	38	27	37	34	98	38	13	26	22	61	37
35/39	41	26	36	103	33	45	45	45	135	33	28	39	36	103	34
30/34	37	11	28	76	29	54	46	51	151	29	56	49	51	156	30
25/29	22	9	14	45	25	41	20	38	99	25	45	35	40	120	25
20/24	11	3	6	20	21	25	12	17	54	20	25	21	31	77	20
15/19	3	1	4	8	15	12	6	9	27	16	27	17	20	64	15
10/14	2	0	1	3	11	10	4	7	21	11	20	8	13	41	11
5/9	1	0	0	1	6	7	2	3	12	6	11	3	6	20	6
0/4	0	0	0	0	0	2	0	2	4	1	8	3	4	15	1
-5/-1	0	0	0	0	0	0	0	0	0	0	2	0	0	2	-6

Temperature Range (°F)	February					March					April					Annual (Total - All Months				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
110/114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	76
105/109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	76
100/104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	1	12	73
95/99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	4	53	74
90/94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	2	151	24	177	74
85/89	0	0	0	0	0	0	0	0	0	63	0	6	0	6	66	20	252	87	359	72
80/84	0	0	0	0	61	0	1	0	1	62	0	17	2	19	65	78	307	199	584	70
75/79	0	1	0	1	59	0	5	0	5	62	1	24	9	34	63	210	270	279	759	68
70/74	0	2	0	2	59	0	8	3	11	58	8	30	19	57	60	318	231	291	840	65
65/69	0	4	2	6	56	1	13	6	20	54	21	29	30	80	58	283	189	267	739	60
60/64	1	9	2	12	51	6	19	10	35	52	30	26	33	89	55	258	170	221	649	56
55/59	4	15	7	26	50	11	22	19	52	48	31	30	31	92	50	213	172	190	575	51
50/54	9	21	15	45	46	17	28	25	70	45	35	34	32	101	45	195	180	197	572	46
45/49	13	29	22	64	42	22	32	32	86	41	33	21	34	88	42	191	174	194	559	42
40/44	24	35	31	90	38	40	42	42	124	37	39	16	30	85	38	232	201	214	647	38
35/39	39	38	43	120	34	54	39	45	138	34	29	6	15	50	34	251	194	227	672	34
30/34	55	34	47	136	30	43	22	33	98	29	10	1	4	15	29	260	163	214	637	30
25/29	32	15	25	72	25	27	9	18	54	25	3	0	1	4	25	170	88	136	394	25
20/24	18	11	12	41	20	14	6	9	29	20	0	0	0	0	22	94	53	74	221	20
15/19	11	7	8	26	15	8	1	3	12	16	0	0	0	0	0	61	32	43	136	15
10/14	10	4	8	22	11	2	1	2	5	11	0	0	0	0	0	45	18	31	94	11
5/9	6	1	3	10	6	2	0	1	3	6	0	0	0	0	0	27	7	12	46	6
0/4	4	-0	1	5	-0	1	0	0	1	0	0	0	0	0	0	15	4	7	26	0
-5/-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	-6

* INDIANAPOLIS INDIANA

Mean Frequency of Occurrence of Dry Bulb Temperature (°F) With Mean Coincident Wet Bulb Temperature (°F) For Each Dry Bulb Temperature Range

COOLING SEASON

Temperature Range (°F)	MAY					JUNE					JULY					AUGUST					SEPTEMBER					OCTOBER				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
100/104							0		0	75		0		0	78							0		0	71					
95/99							3	0	3	76		4	0	4	76		2		2	72		3		3	69					
90/94		1		1	69	0	24	1	25	74	1	22	1	24	75		19	0	19	74	0	11	0	11	71					
85/89	0	7	0	7	69	4	37	6	47	72	4	58	9	71	73	2	52	4	58	73	1	31	2	34	71		3		3	68
80/84	1	22	2	25	67	11	51	22	84	70	14	80	31	125	71	10	80	21	111	71	3	39	8	50	68	0	12	0	12	65
75/79	4	42	12	58	65	28	54	42	124	68	39	57	63	159	69	27	60	55	142	69	10	45	23	78	66	1	24	2	27	63
70/74	15	48	26	89	63	47	37	61	145	66	77	22	81	180	68	70	27	80	177	68	35	48	48	131	64	5	35	7	47	61
65/69	35	47	45	127	60	56	20	52	128	62	68	5	46	119	64	69	8	55	132	64	48	40	49	137	61	14	40	21	75	59
60/64	48	39	54	141	57	48	8	32	88	58	34	0	15	49	59	49	0	26	75	59	47	17	45	109	57	20	40	34	94	55
55/59	43	16	42	101	52	29	5	16	50	54	9		2	11	55	17		7	24	55	39	4	34	77	53	33	35	41	109	51
50/54	42	14	30	86	48	14	1	7	22	50	2			2	52	4		0	4	51	30	1	22	53	49	41	30	47	118	47
45/49	30	8	21	59	44	3		1	4	46											20	1	8	29	45	48	18	42	108	43
40/44	19	3	12	34	39	0		0	0	41											7		1	8	41	44	8	32	84	40
35/39	9	1	4	14	36	0			0	38											0		0	0	37	27	3	16	46	35
30/34	2		0	2	31																					12	0	5	17	30
25/29																										3		1	4	26
20/24																										0			0	22

HEATING SEASON

Temperature Range (°F)	NOVEMBER					DECEMBER					JANUARY					FEBRUARY					MARCH					APRIL					ANNUAL (TOTAL—ALL MONTHS)				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
100/104																																1		1	76
95/99																																11	0	11	73
90/94																															1	77	2	80	74
85/89																											1		1	67	12	190	21	223	70
80/84																											8	0	8	64	39	292	84	415	68
75/79		1		1	68																	0		0	60	1	20	2	23	63	110	304	198	612	66
70/74		5	1	6	61												0		0	61		4	0	4	58	4	26	10	40	60	254	252	315	821	63
65/69	1	13	2	16	58		2	1	3	59		1	0	1	61	0	1	1	2	58	0	8	3	11	58	13	27	21	61	58	305	211	296	812	60
60/64	5	20	8	33	55	0	3	1	4	56	1	2	1	4	58	1	6	2	9	56	4	14	5	23	54	27	30	33	90	56	285	179	257	721	57
55/59	13	25	17	55	52	3	7	4	14	52	2	2	3	7	54	2	9	2	13	54	6	24	9	39	50	25	28	29	82	50	221	156	207	584	53
50/54	18	29	22	69	47	8	17	9	34	48	5	9	5	19	49	5	13	6	24	47	12	26	19	57	48	30	34	34	98	47	215	171	199	585	48
45/49	22	33	26	81	42	14	20	16	50	43	5	16	7	28	43	8	28	13	49	42	21	29	29	79	42	33	30	33	96	42	202	183	196	581	43
40/44	30	34	34	98	38	20	31	20	71	39	8	24	12	44	38	14	32	24	70	38	30	44	39	113	38	36	24	35	95	38	207	201	209	617	39
35/39	36	26	44	106	34	30	51	42	123	34	22	42	29	93	34	33	46	42	121	34	42	47	43	132	34	37	10	27	74	35	235	226	246	707	35
30/34	48	27	38	113	30	53	48	52	153	30	51	58	62	171	30	56	41	60	157	30	55	28	52	135	30	22	5	14	41	30	299	204	285	788	30
25/29	35	17	27	79	25	44	33	45	122	25	54	40	48	142	25	46	25	34	105	25	43	13	28	84	25	8		2	10	26	232	128	184	544	25
20/24	21	8	13	42	21	31	17	28	76	21	35	23	29	87	21	26	9	17	52	20	17	6	11	34	21	1		0	1	21	132	63	98	293	21
15/19	6	1	4	11	16	16	10	12	38	16	22	15	23	60	16	13	7	10	30	15	8	3	6	17	16						64	36	56	156	16
10/14	3	1	3	7	11	13	4	8	25	11	16	9	14	39	11	7	4	5	16	10	6	2	2	10	11						45	19	33	97	11
5/9	1		1	2	6	6	3	5	14	6	13	5	8	26	6	6	2	5	13	6	2	0	1	3	6						30	10	19	59	6
0/4	1			1	1	5	2	3	10	2	9	2	4	15	2	5	1	3	9	1	1		1	2	1						20	5	11	36	2
—5/—1						3	0	2	5	—1	4	0	2	6	—3	2	0	0	2	—3	1			1	—2						9	1	3	13	—2
—10/—6						1		0	1	—8	1		1	2	—8						0			0	—6						2		1	3	—8
—15/—11						1		0	1	—13	0			0	—11																1		0	1	—12

GRAND RAPIDS, MICHIGAN (Substitute Station for Kalamazoo)

Mean Frequency of Occurrence of Dry Bulb Temperature (°F) With Mean Coincident Wet Bulb Temperature (°F) For Each Dry Bulb Temperature Range

COOLING SEASON

Temperature Range (°F)	May Obsn/Hour Gp 02 to 09	May Obsn/Hour Gp 10 to 17	May Obsn/Hour Gp 18 to 01	May Total Obsn	May Mean Coincident Wet Bulb (°F)	June Obsn/Hour Gp 02 to 09	June Obsn/Hour Gp 10 to 17	June Obsn/Hour Gp 18 to 01	June Total Obsn	June Mean Coincident Wet Bulb (°F)	July Obsn/Hour Gp 02 to 09	July Obsn/Hour Gp 10 to 17	July Obsn/Hour Gp 18 to 01	July Total Obsn	July Mean Coincident Wet Bulb (°F)
100/104	0	0	0	0	0	0	0	0	0	76	0	0	0	0	0
95/99	0	0	0	0	0	0	1	0	1	77	0	1	0	1	78
90/94	0	0	0	0	75	0	7	1	8	73	0	12	1	13	73
85/89	0	3	0	3	69	0	27	6	33	71	1	42	9	52	71
80/84	0	14	2	16	66	4	42	17	63	68	5	63	27	95	68
75/79	1	26	10	37	63	12	51	31	94	65	16	64	48	128	67
70/74	5	38	19	62	60	29	49	49	127	63	50	48	65	163	65
65/69	20	41	32	93	57	49	35	50	134	60	69	12	54	135	63
60/64	32	41	41	114	54	49	17	41	107	57	59	5	32	96	59
55/59	39	34	43	116	50	43	8	27	78	53	32	1	11	44	54
50/54	40	24	41	105	47	33	3	14	50	49	15	0	1	16	50
45/49	45	18	32	95	43	15	0	3	18	45	1	0	0	1	47
40/44	34	7	19	60	39	5	0	1	6	41	0	0	0	0	0
35/39	26	2	7	35	35	1	0	0	1	37	0	0	0	0	0
30/34	6	0	2	8	31	0	0	0	0	0	0	0	0	0	0
25/29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0/4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-5/-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-10/-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Temperature Range (°F)	August Obsn/Hour Gp 02 to 09	August Obsn/Hour Gp 10 to 17	August Obsn/Hour Gp 18 to 01	August Total Obsn	August Mean Coincident Wet Bulb (°F)	September Obsn/Hour Gp 02 to 09	September Obsn/Hour Gp 10 to 17	September Obsn/Hour Gp 18 to 01	September Total Obsn	September Mean Coincident Wet Bulb (°F)	October Obsn/Hour Gp 02 to 09	October Obsn/Hour Gp 10 to 17	October Obsn/Hour Gp 18 to 01	October Total Obsn	October Mean Coincident Wet Bulb (°F)
100/104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95/99	0	2	0	2	73	0	1	0	1	73	0	0	0	0	0
90/94	0	13	1	14	72	0	7	1	8	72	0	0	0	0	0
85/89	1	31	8	40	71	0	13	3	16	71	0	0	0	0	68
80/84	3	62	20	85	69	1	22	7	30	69	0	4	0	4	61
75/79	13	64	42	119	67	10	32	19	61	66	0	10	0	10	62
70/74	47	46	64	157	66	17	44	25	86	63	1	22	4	27	60
65/69	64	24	58	146	63	29	51	42	122	60	6	36	17	59	59
60/64	56	5	37	98	59	42	40	45	127	56	16	42	25	83	55
55/59	40	1	14	55	55	43	21	40	104	53	27	39	36	102	51
50/54	18	0	3	21	50	42	8	33	83	49	35	42	42	119	47
45/49	6	0	1	7	46	32	1	16	49	45	47	29	55	131	44
40/44	0	0	0	0	43	15	0	7	22	41	48	17	36	101	40
35/39	0	0	0	0	0	8	0	2	10	36	37	7	22	66	35
30/34	0	0	0	0	0	1	0	0	1	33	25	0	9	34	31
25/29	0	0	0	0	0	0	0	0	0	0	4	0	2	6	27
20/24	0	0	0	0	0	0	0	0	0	0	2	0	0	2	22
15/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0/4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-5/-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-10/-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HEATING SEASON

Temperature Range (°F)	November					December					January					February					March					April					Annual (Total - All Months)				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
100/104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76
95/99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	74
90/94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	3	42	72
85/89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	116	25	143	71
80/84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	62	13	210	73	296	68
75/79	0	0	0	0	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	11	61	51	257	151	459	66
70/74	0	1	1	2	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	55	1	14	4	19	59	149	261	230	640	64
65/69	0	4	1	5	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	53	3	20	11	34	56	240	227	267	734	60
60/64	4	13	5	22	56	0	0	0	0	56	0	0	0	0	0	0	0	0	0	57	0	2	2	4	53	8	25	16	49	53	267	191	244	702	56
55/59	8	18	13	39	52	1	2	1	4	52	0	1	0	1	52	1	1	0	2	52	1	8	3	12	49	17	30	25	72	49	252	163	213	628	52
50/54	13	26	15	54	47	1	6	4	11	48	0	1	0	1	49	0	3	2	5	48	3	14	6	23	44	23	33	34	90	46	222	159	196	577	47
45/49	18	34	26	78	42	4	8	4	16	43	1	1	1	3	45	2	7	3	12	43	3	24	11	38	41	39	34	41	114	42	216	156	193	565	43
40/44	41	45	44	130	39	9	20	12	41	39	1	6	3	10	39	6	13	7	26	38	13	32	22	67	37	36	34	37	107	38	208	173	189	570	39
35/39	47	44	44	135	34	33	47	40	120	35	13	31	16	60	34	13	47	27	87	34	35	56	43	134	34	47	26	38	111	34	259	259	240	758	34
30/34	52	34	49	135	30	63	64	63	190	30	42	58	51	151	30	45	61	55	161	30	60	56	65	181	30	42	11	24	77	30	336	284	317	937	30
25/29	36	13	27	76	26	43	47	51	141	25	49	56	58	163	26	43	47	46	136	25	54	30	51	135	25	18	1	8	27	26	247	194	243	684	26
20/24	14	5	9	28	21	38	28	32	98	21	46	42	45	133	21	44	24	40	108	21	39	18	27	84	21	5	0	1	6	21	187	118	154	459	21
15/19	2	1	4	7	17	26	17	24	67	16	38	28	31	97	16	31	11	23	65	16	22	3	14	39	16	1	0	0	1	16	121	60	96	277	16
10/14	3	1	1	5	12	20	6	11	37	12	30	18	27	75	12	18	8	12	38	12	11	1	4	16	12	0	0	0	0	12	81	34	55	170	12
5/9	2	1	1	4	8	5	2	4	11	7	17	5	11	33	7	13	3	8	24	7	5	0	0	5	7	0	0	0	0	0	41	11	24	76	7
0/4	0	0	0	0	0	5	1	2	8	0	10	1	5	16	2	9	1	2	12	1	2	0	0	2	2	0	0	0	0	0	25	2	10	37	1
-5/-1	0	0	0	0	0	0	0	0	0	-4	1	0	0	1	-6	1	0	1	2	-5	0	0	0	0	0	0	0	0	0	0	1	0	1	2	-5
-10/-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-10	0	0	0	0	-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-10

NEWARK, NEW JERSEY (Substitute Station for Jersey City)

Mean Frequency of Occurrence of Dry Bulb Temperature (°F) With Mean Coincident Wet Bulb Temperature (°F) For Each Dry Bulb Temperature Range

COOLING SEASON

Tem-pera-ture Range (°F)	May					June					July					August					September					October				
	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
100/104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95/99	0	0	0	0	71	0	4	0	4	74	0	9	0	9	74	0	4	0	4	75	0	0	0	0	75	0	0	0	0	0
90/94	0	4	0	4	72	0	13	3	16	73	0	24	4	28	74	0	19	2	21	75	0	9	1	10	75	0	0	0	0	75
85/89	0	12	1	13	69	2	31	8	41	70	3	54	16	73	72	1	41	10	52	72	0	18	3	21	72	0	1	0	1	72
80/84	1	19	7	27	66	7	47	22	76	68	14	67	39	120	69	9	64	30	103	70	2	34	12	48	70	0	8	1	9	66
75/79	4	29	13	46	63	20	52	34	106	66	48	55	69	172	68	37	66	66	169	69	15	49	28	92	68	0	21	3	24	64
70/74	16	40	24	80	60	49	44	56	149	64	87	27	79	193	67	80	43	79	202	66	38	43	47	128	65	3	30	10	43	62
65/69	26	54	38	118	58	62	31	53	146	61	70	8	34	112	62	75	9	48	132	63	46	46	53	145	60	13	45	28	86	59
60/64	45	47	50	142	54	58	14	43	115	57	23	3	6	32	58	36	1	12	49	58	56	29	50	135	57	37	60	54	151	56
55/59	57	22	55	134	51	35	4	19	58	53	3	1	1	5	54	10	1	1	12	54	41	10	29	80	52	49	41	55	145	51
50/54	53	13	37	103	47	6	0	1	7	49	0	0	0	0	0	0	0	0	0	0	27	1	13	41	48	56	26	47	129	47
45/49	34	8	19	61	43	0	0	0	0	47	0	0	0	0	0	0	0	0	0	0	11	0	4	15	43	45	12	30	87	42
40/44	10	0	3	13	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	39	31	4	15	50	38
35/39	1	0	1	2	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	13	0	4	17	34
30/34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
25/29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0/4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HEATING SEASON

Tem-pera-ture Range (°F)	November					December					January					February					March					April					Annual (Total - All Months)				
	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
100/104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74
95/99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	1	19	74
90/94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68	1	69	10	80	74
85/89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	65	6	160	39	205	71
80/84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	2	10	62	32	247	111	390	69
75/79	0	1	0	1	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	58	0	6	3	9	60	125	280	215	620	67
70/74	0	3	0	3	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	5	55	2	16	6	24	58	275	250	300	825	65
65/69	1	13	4	18	60	0	1	0	1	55	0	0	0	0	0	0	0	0	0	56	0	4	1	5	53	4	20	11	35	55	296	232	270	798	60
60/64	9	25	11	45	55	0	2	1	3	54	1	0	0	1	59	0	2	0	2	54	1	10	3	14	50	13	34	18	65	52	278	225	247	750	56
55/59	19	47	30	96	51	3	8	4	15	52	1	1	1	3	54	1	4	1	6	51	3	17	9	29	47	21	38	31	90	49	242	195	235	672	51
50/54	34	48	49	131	47	6	15	5	26	47	2	6	1	9	47	1	9	5	15	46	7	30	17	54	43	43	47	53	143	46	235	195	227	657	46
45/49	43	41	45	129	42	13	23	21	57	42	4	17	7	28	42	5	26	9	40	41	15	47	28	90	40	56	40	52	148	42	226	212	215	653	42
40/44	46	34	44	124	37	24	44	32	100	38	14	45	27	86	38	18	43	31	92	37	47	53	61	161	37	58	22	45	125	38	252	243	259	754	38
35/39	48	17	37	102	33	45	55	51	151	34	40	60	53	153	33	47	52	56	155	33	75	47	70	192	33	31	4	16	51	33	299	236	288	823	33
30/34	28	8	14	50	29	50	44	50	144	29	56	53	57	166	29	48	42	58	148	29	54	24	36	114	29	10	1	3	14	30	246	170	219	635	29
25/29	7	2	5	14	24	39	31	38	108	24	48	32	45	125	24	43	22	28	93	24	25	8	13	46	24	1	0	0	1	24	162	94	129	385	24
20/24	3	1	1	5	19	31	17	27	75	19	34	24	29	87	19	29	15	20	64	19	16	2	8	26	19	0	0	0	0	0	113	58	85	256	19
15/19	1	0	0	1	15	24	6	14	44	15	27	8	19	54	15	16	7	11	34	14	4	0	1	5	14	0	0	0	0	0	72	21	45	138	15
10/14	0	0	0	0	0	11	2	3	16	10	14	1	6	21	11	11	3	5	19	10	1	0	0	1	9	0	0	0	0	0	37	6	14	57	10
5/9	0	0	0	0	0	1	0	1	2	5	5	1	2	8	5	5	1	2	8	6	0	0	0	0	0	0	0	0	0	0	11	2	5	18	6
0/4	0	0	0	0	0	0	0	1	1	1	1	0	0	1	2	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	4	0	1	5	1

MEMPHIS NAS TENNESSEE

Mean Frequency of Occurrence of Dry Bulb Temperature (°F) With Mean Coincident Wet Bulb Temperature (°F) For Each Dry Bulb Temperature Range

COOLING SEASON

Tempera-ture Range (°F)	MAY					JUNE					JULY					AUGUST					SEPTEMBER					OCTOBER				
	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Co-inci-dent Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
105/109							0		0	76																				
100/104							2	0	2	76		4	0	4	77		4	0	4	78		2		2	74					
95/99						0	7	1	8	75		18	1	19	78		24	2	26	77		6	0	6	74					
90/94		11	1	12	73	0	44	6	50	75	1	77	12	90	77	1	76	10	87	77	0	25	1	26	74		3		3	73
85/89	0	48	6	54	72	6	66	20	92	73	11	78	34	123	76	10	77	33	120	75	2	56	8	66	73	0	13	0	13	70
80/84	7	62	24	93	70	25	60	43	128	72	41	47	67	155	74	33	43	64	140	74	9	59	22	90	71	1	37	3	41	68
75/79	23	47	47	117	68	51	37	73	161	70	88	19	87	194	72	81	18	82	181	72	32	45	58	135	70	7	50	14	71	66
70/74	51	33	63	147	66	88	19	63	170	68	85	5	43	133	70	85	5	46	136	69	69	30	69	168	67	18	47	31	96	64
65/69	72	25	50	147	62	44	3	25	72	63	18	0	4	22	64	30	1	9	40	64	55	12	46	113	62	35	37	44	116	61
60/64	45	13	30	88	57	20	2	7	29	59	4		0	4	58	7		2	9	59	43	4	26	73	58	41	31	50	122	57
55/59	25	7	15	47	52	5		2	7	55	0			0	57	1			1	56	22	1	8	31	53	42	17	41	100	52
50/54	13	2	10	25	47	1			1	51											7		2	9	49	41	9	34	84	48
45/49	11	0	2	13	43																1			1	44	35	4	20	59	44
40/44	1		0	1	40																					20	0	8	28	40
35/39																										6		3	9	35
30/34																										2		0	2	31

HEATING SEASON

Temperature Range (°F)	NOVEMBER					DECEMBER					JANUARY					FEBRUARY					MARCH					APRIL					ANNUAL (TOTAL—ALL MONTHS)				
	Obsn/ Hour Gp			*Total Obsn*	*Mean Coincident Wet Bulb (°F)*	*Obsn/ Hour Gp*			*Total Obsn*	*Mean Coincident Wet Bulb (°F)*	*Obsn/ Hour Gp*			*Total Obsn*	*Mean Coincident Wet Bulb (°F)*	*Obsn/ Hour Gp*			*Total Obsn*	*Mean Coincident Wet Bulb (°F)*	*Obsn/ Hour Gp*			*Total Obsn*	*Mean Coincident Wet Bulb (°F)*	*Obsn/ Hour Gp*			*Total Obsn*	*Mean Coincident Wet Bulb (°F)*	*Obsn/ Hour Gp*			*Total Obsn*	*Mean Coincident Wet Bulb (°F)*
	02 to 09	*10 to 17*	*18 to 01*			*02 to 09*	*10 to 17*	*18 to 01*			*02 to 09*	*10 to 17*	*18 to 01*			*02 to 09*	*10 to 17*	*18 to 01*			*02 to 09*	*10 to 17*	*18 to 01*			*02 to 09*	*10 to 17*	*18 to 01*			*02 to 09*	*10 to 17*	*18 to 01*		
105/109																																0		0	76
100/104																																11	0	11	77
95/99																															0	55	4	59	77
90/94																															3	237	81	271	76
85/39																											5	0	5	70	29	848	108	475	73
30/84		2	0	2	69												0		0	68		2	0	2	60		35	5	40	63	116	847	223	641	69
75/79		10	1	11	65		0		0	69							2	0	2	54		10	2	12	64	6	89	18	68	66	238	278	882	943	53
70/74	5	26	8	39	53		3	0	3	53	0	1	0	1	66	1	9	2	12	62	8	21	9	83	52	20	42	85	97	68	425	240	369	1034	65
65/69	7	25	11	44	59	2	9	3	14	50	2	6	2	10	52	4	13	8	25	61	10	24	14	48	53	83	34	41	103	60	311	190	257	753	61
50/64	14	34	22	70	55	5	20	9	35	57	5	13	8	25	53	3	25	11	44	55	16	32	25	73	54	43	32	43	113	56	252	205	283	690	57
55/59	25	38	29	92	51	15	31	22	58	53	8	22	12	42	53	15	25	23	63	52	24	30	29	83	50	41	27	37	105	51	224	197	219	640	53
50/54	28	37	38	103	47	19	37	27	83	48	9	22	14	45	47	22	31	27	80	47	27	43	37	107	46	86	17	32	85	47	203	198	222	623	48
45/49	38	32	42	112	43	22	39	29	90	43	15	34	25	74	43	25	27	33	86	48	42	33	44	124	48	35	8	19	62	43	224	182	212	618	43
40/44	43	18	41	102	38	44	45	48	137	39	29	38	33	105	39	34	37	31	102	39	44	26	42	112	33	13	1	8	27	39	231	165	215	511	39
35/39	37	11	28	75	34	48	35	48	131	34	44	45	47	137	35	35	22	35	93	35	39	12	28	79	34	7	0	1	3	35	217	127	189	583	35
30/34	27	5	14	45	30	44	17	34	95	30	57	84	54	145	30	35	17	27	79	30	30	7	13	50	80	1	0	1	2	32	195	31	141	417	30
25/29	10	1	5	16	25	29	8	20	57	25	39	16	25	80	25	20	11	15	45	24	10	2	4	15	25						103	88	68	214	25
20/24	5	0	1	6	20	10	2	6	18	21	18	3	11	87	20	14	4	3	26	20	2	1	1	4	20						51	15	29	95	20
15/19	1			1	13	6	1	1	8	15	10	4	7	21	15	4	1	2	7	15	1		0	1	15						22	6	10	83	16
10/14						2	1	0	3	11	7	3	3	13	11	8	0	2	5	11	0			0	10						12	4	5	21	11
5/9						1	0	1	2	5	2	1	1	4	7	2		0	2	6											5	1	2	8	6
0/4						0		0	0	4	2	0	1	3	2																3	0	1	4	2
—5/—1											1		0	1	—2																1		0	1	—2

HOUSTON, TEXAS

Mean Frequency of Occurrence of Dry Bulb Temperature (°F) With Mean Coincident Wet Bulb Temperature (°F) For Each Dry Bulb Temperature Range

COOLING SEASON

	May					June					July					August					September					October				
Temperature Range (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
105/109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	0	0	0	0	0	0	0	0	0
100/104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	79	0	0	0	0	0	0	0	0	0	0
95/99	0	0	0	0	78	0	5	0	5	77	0	19	1	20	78	0	18	1	19	78	0	2	0	2	76	0	0	0	0	0
90/94	0	9	0	9	74	0	52	3	55	76	0	108	8	116	78	0	93	6	99	77	0	41	1	42	77	0	7	0	7	76
85/89	0	77	3	80	74	11	118	21	150	76	22	87	36	145	77	18	85	29	132	77	6	96	10	112	76	1	37	0	38	74
80/84	19	106	27	152	72	42	41	61	144	75	50	20	87	157	77	43	32	88	163	77	28	57	47	132	75	5	74	7	86	71
75/79	60	36	82	178	72	95	16	111	222	74	145	11	108	264	75	153	13	112	278	75	98	29	115	242	74	22	62	38	122	70
70/74	80	15	90	185	69	76	7	38	121	71	30	2	7	39	72	30	2	10	42	71	68	11	46	125	69	51	36	73	160	67
65/69	57	4	34	95	65	12	1	4	17	65	0	0	0	0	69	2	0	0	2	66	26	2	17	45	64	61	16	60	137	63
60/64	23	1	11	35	59	3	0	1	4	59	0	0	0	0	0	0	0	0	0	0	11	0	2	13	60	48	7	38	93	58
55/59	8	0	1	9	54	1	0	0	1	57	0	0	0	0	0	0	0	0	0	0	1	0	0	1	54	31	4	19	54	53
50/54	1	0	0	1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	2	9	31	49
45/49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	1	7	43
40/44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	39
35/39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	36
30/34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25/29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HEATING SEASON

Temperature Range (°F)	November					December					January					February				
	Obsn/Hour Gp			Total Obsn	Mean Co-incident Wet Bulb (°F)	Obsn/Hour Gp			Total Obsn	Mean Co-incident Wet Bulb (°F)	Obsn/Hour Gp			Total Obsn	Mean Co-incident Wet Bulb (°F)	Obsn/Hour Gp			Total Obsn	Mean Co-incident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
105/109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100/104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95/99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90/94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
85/89	0	1	0	1	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65
80/84	0	26	0	26	72	0	3	0	3	70	0	1	0	1	69	0	6	0	6	69
75/79	8	40	11	59	70	0	17	0	17	68	0	10	0	10	67	0	19	1	20	68
70/74	26	41	31	98	67	4	28	7	39	65	2	27	5	34	65	6	33	14	53	66
65/69	29	42	39	110	62	16	40	23	79	62	17	29	21	67	63	26	36	27	89	62
60/64	34	32	41	107	57	29	44	36	109	58	20	30	25	75	58	24	29	32	85	58
55/59	36	26	43	105	52	36	43	44	123	53	22	45	36	103	53	26	31	35	92	53
50/54	35	14	35	84	47	39	32	47	118	48	40	40	54	134	48	36	32	39	107	48
45/49	36	9	23	68	43	40	21	45	106	44	39	27	42	108	43	41	16	34	91	44
40/44	19	7	13	39	38	38	11	27	76	39	47	18	30	95	39	31	13	26	70	40
35/39	12	2	4	18	34	26	6	14	46	34	28	11	20	59	34	22	8	12	42	35
30/34	4	0	0	4	29	15	2	4	21	30	22	6	9	37	29	10	3	5	18	31
25/29	0	0	0	0	25	2	0	1	3	24	6	3	4	13	24	4	0	1	5	26
20/24	0	0	0	0	0	2	0	0	2	21	3	1	2	6	19	0	0	0	0	0
15/19	0	0	0	0	0	0	0	0	0	0	2	0	0	2	16	0	0	0	0	0

Temperature Range (°F)	March					April					Annual (Total - All Months)				
	Obsn/Hour Gp			Total Obsn	Mean Co-incident Wet Bulb (°F)	Obsn/Hour Gp			Total Obsn	Mean Co-incident Wet Bulb (°F)	Obsn/Hour Gp			Total Obsn	Mean Co-incident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
105/109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80
100/104	0	0	0	0	0	0	0	0	0	0	0	2	0	2	79
95/99	0	0	0	0	0	0	0	0	0	0	0	44	2	46	78
90/94	0	0	0	0	0	0	0	0	0	76	0	309	18	327	77
85/89	0	1	0	1	67	0	9	0	9	72	58	512	100	670	76
80/84	0	14	0	14	68	0	54	3	57	71	188	435	321	944	74
75/79	1	47	4	52	66	13	74	26	113	69	595	374	606	1575	73
70/74	20	55	30	105	65	73	50	79	202	68	465	306	431	1202	68
65/69	38	49	52	139	62	46	30	54	130	63	330	249	330	909	63
60/64	40	33	50	123	57	43	17	45	105	58	274	193	280	747	58
55/59	45	21	47	113	52	39	5	23	67	53	245	175	247	667	53
50/54	38	13	33	84	48	16	1	9	26	48	224	135	224	583	48
45/49	31	9	20	60	43	9	0	1	10	44	202	82	167	451	43
40/44	22	4	9	35	39	1	0	0	1	40	159	54	106	319	39
35/39	9	1	3	13	35	0	0	0	0	39	97	28	53	178	34
30/34	4	1	0	5	30	0	0	0	0	0	54	11	19	84	30
25/29	0	0	0	0	0	0	0	0	0	0	13	3	6	22	24
20/24	0	0	0	0	0	0	0	0	0	0	5	1	2	8	19
15/19	0	0	0	0	0	0	0	0	0	0	2	0	0	2	16

SEATTLE, WASHINGTON

Mean Frequency of Occurrence of Dry Bulb Temperature (°F) With Mean Coincident Wet Bulb Temperature (°F) For Each Dry Bulb Temperature Range

COOLING SEASON

	May					June					July					August					September					October				
Temperature Range (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
95/99	0	0	0	0	0	0	1	0	1	67	0	1	0	1	70	0	1	0	1	68	0	0	0	0	0	0	0	0	0	0
90/94	0	1	0	1	64	0	1	0	1	67	0	4	1	5	68	0	1	0	1	68	0	0	0	0	0	0	0	0	0	0
85/89	0	3	0	3	64	0	3	1	4	65	0	12	4	16	66	0	5	1	6	67	0	2	0	2	65	0	0	0	0	0
80/84	0	7	2	9	62	0	10	3	13	64	1	22	9	32	65	0	20	5	25	65	0	8	1	9	62	0	0	0	0	68
75/79	0	11	4	15	60	0	17	7	24	62	1	34	16	51	63	0	39	11	50	63	0	20	3	23	62	0	1	0	1	62
70/74	1	20	7	28	58	2	35	14	51	59	7	50	32	89	61	3	66	31	100	61	1	41	11	53	60	0	6	0	6	60
65/69	3	38	17	58	55	8	58	34	100	57	19	61	50	130	58	16	70	61	147	59	6	62	30	98	58	0	26	2	28	58
60/64	12	51	35	98	53	34	60	56	150	55	70	36	72	178	56	85	37	95	217	57	37	69	79	185	56	12	54	25	91	56
55/59	43	60	56	159	51	100	30	76	206	53	104	9	40	153	54	108	7	36	151	54	90	34	76	200	53	39	78	64	181	53
50/54	83	34	68	185	48	67	6	26	99	49	22	0	2	24	50	31	0	5	36	51	74	4	34	112	50	79	62	85	226	49
45/49	59	4	31	94	44	8	0	2	10	46	2	0	0	2	46	3	0	0	3	47	25	0	6	31	46	71	17	53	141	45
40/44	23	0	6	29	40	0	0	0	0	42	0	0	0	0	0	0	0	0	0	0	7	0	0	7	42	36	4	17	57	41
35/39	2	0	0	2	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	1	10	37
30/34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	33
25/29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HEATING SEASON

Temperature Range (°F)	November					December					January				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
95/99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90/94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
85/89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80/84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75/79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70/74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65/69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60/64	0	4	1	5	54	0	1	0	1	51	0	1	0	1	47
55/59	7	23	8	38	52	3	9	4	16	52	0	6	1	7	50
50/54	29	78	41	148	48	19	44	24	87	48	11	32	17	60	47
45/49	66	68	77	211	44	57	78	68	203	44	39	70	57	166	44
40/44	58	42	60	160	40	61	61	68	190	40	68	74	75	217	39
35/39	47	17	36	100	35	62	37	53	152	36	71	38	57	166	35
30/34	24	5	11	40	31	33	12	25	70	31	31	17	24	72	30
25/29	7	1	2	10	25	9	3	4	16	26	13	7	9	29	24
20/24	0	2	1	3	19	2	1	1	4	20	7	2	6	15	20
15/19	2	0	2	4	15	1	1	0	2	13	5	0	1	6	15
10/14	0	0	1	1	11	1	0	0	1	11	2	0	0	2	12
5/9	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0

Temperature Range (°F)	February					March					April					Annual (Total - All Months)				
	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)	Obsn/ Hour Gp			Total Obsn	Mean Coincident Wet Bulb (°F)
	02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01			02 to 09	10 to 17	18 to 01		
95/99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	68
90/94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	7	67
85/89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	6	31	66
80/84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	1	67	20	88	64
75/79	0	0	0	0	0	0	0	0	0	0	0	2	0	2	56	2	124	41	167	62
70/74	0	0	0	0	55	0	0	0	0	56	0	6	1	7	55	14	225	96	335	60
65/69	0	1	0	1	51	0	1	0	1	54	0	17	3	20	53	53	337	197	587	58
60/64	0	4	1	5	52	0	10	1	11	51	1	29	11	41	51	252	355	377	984	56
55/59	2	18	5	25	50	0	26	6	32	48	8	64	32	104	49	503	364	404	1271	52
50/54	15	52	27	94	47	7	73	31	111	46	40	83	70	193	46	476	468	428	1372	48
45/49	46	72	61	179	43	60	83	87	230	43	100	34	84	218	44	534	426	526	1486	44
40/44	72	50	71	193	39	95	40	82	217	39	69	5	34	108	40	489	276	413	1178	40
35/39	48	21	41	110	35	59	12	31	102	35	20	0	5	25	36	317	124	224	665	35
30/34	30	6	14	50	31	22	2	8	32	31	2	0	0	2	33	143	41	80	264	31
25/29	9	1	4	14	25	3	1	1	5	26	0	0	0	0	0	41	13	19	73	25
20/24	3	1	1	5	20	1	0	0	1	21	0	0	0	0	0	14	6	9	29	20
15/19	1	0	1	2	16	1	0	0	1	18	0	0	0	0	0	10	1	4	15	15
10/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	4	11
5/9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9

Table F Mean Wind Climate Airport Exposure for the Structural Design

	Ref. (14)	Ref. (14)	Ref. (11)	Ref. (14, 9)			Ref. (9)
Site localities and U. S. W. B. Station Location	Station Elevation Above MSL (ft)	Observed Fastest Mile Wind Speed (mph)	Annual Extreme Mile Speed 50-year Mean Recurrence Interval (mph)	Mean Wind Speed and Direction (mph)			Average Annual Number of Storms with Winds of 47 mph or over
				January	July	Annual	
Sacramento, Calif. Municipal AP	17	70	65	8.3 SE	9.4 SSW	9.3 SSE	5
Wilmington, Del. New Castle County AP	78	58	75	9.7 WNW	7.6 S	8.8 NW	2
Macon, Georgia Cochran Field	354	70	80	8.5 NW	7.2 WSW	8.9 WNW	1
Indianapolis, Ind. Weir Cook AP	792	90	90	11.3 NW	7.4 SW	10.8 SW	5
Kalamazoo, Mich. Grand Rapids, Mich. Kent County AP	784	58	75	11.5 W	8.3 W	9.8 W	4
St. Louis, Mo. Lambert Field	535	60	70	10.1 NW	7.6 S	9.3 S	2
Jersey City, N. J. Newark, N. J. Newark AP	7	82	75	11.3 WNW	8.9 SW	9.8 SW	1
Memphis, Tenn. Municipal AP	258	56	70	10.7 S	7.7 S	9.4 S	1
Houston, Texas International AP	50	54	80	11.9 SSE	8.8 SSE	11.8 SSE	5
Seattle, Wash. Seattle-Tacoma AP	400	55	80	10.4 SSW	8.7 SW	10.7 SW	1

Table G Air Contamination Data

	Suspended Particulates (Micrograms per cubic meter)				Sulfur Dioxide (Micrograms per cubic meter)				Nitrogen Dioxide (Micrograms per cubic meter)				Ammonia (Micrograms per cubic meter)			
Air Pollution Sampling Sites	Geometic Mean	Maximum	90% Freq. Dist.	Years Covered	Geometic Mean	Maximum	90% Freq. Dist.	Years Covered	Geometic Mean	Maximum	90% Freq. Dist.	Years Covered	Geometic Mean	Maximum	90% Freq. Dist.	Years Covered
Sacramento, California Health Center 2221 Stockton Boulevard Sacramento County Health Dept.	68	403	132	1958-1966												
Wilmington, Delaware Public Building 1000 King Street City Dept. of Health	144	743	262	1957-1968	58	492	168	1964-1968	133	384	276	1964-1968	46	79	71	1968
Macon, Georgia W. T. Grant Co. 418 3rd Street Georgia Dept. of Public Health	96	861	235	1958-1968												
Indianapolis, Indiana Fire Station No. 301 East New York Street City Bureau of Air Pollution	147	367	237	1958-1968	34	249	115	1964-1968	105	405	190	1964-1968	48	113	65	1968
Kalamazoo, Michigan 241 West South Street City County Health Dept.	79	258	151	1957-1962												
St. Louis, Missouri P. O. Bldg. - 18th & Market St. Div. Air Pollution Cont. City Dept. Public Safety	142	658	236	1957-1967	70	294	169	1964-1968	136	405	263	1964-1968	50	82	70	1968
Jersey City, New Jersey Medical Center Garage Bldg. Corneilson Ave. City Board of Health	126	336	201	1959-1968	34	323	221	1967-1968	217	473	429	1967				
Memphis, Tennessee Health Dept. Bldg. 814 Jefferson Street Memphis-Shelby Co. Health Dept.	94	281	149	1958-1968	9	23	18	1968	157	404	238	1968	57	96	87	1968
Houston, Texas Sam Houston Coliseum 810 Bagby Street City Health Dept.	97	385	168	1957-1968												
Seattle, Washington Public Safety Bldg. 604 Third Ave. Puget Sound Air Pollution Control Agency	70	446	127	1957-1968	22	122	58	1964-1968	89	315	199	1964-1968	48	74	61	1968

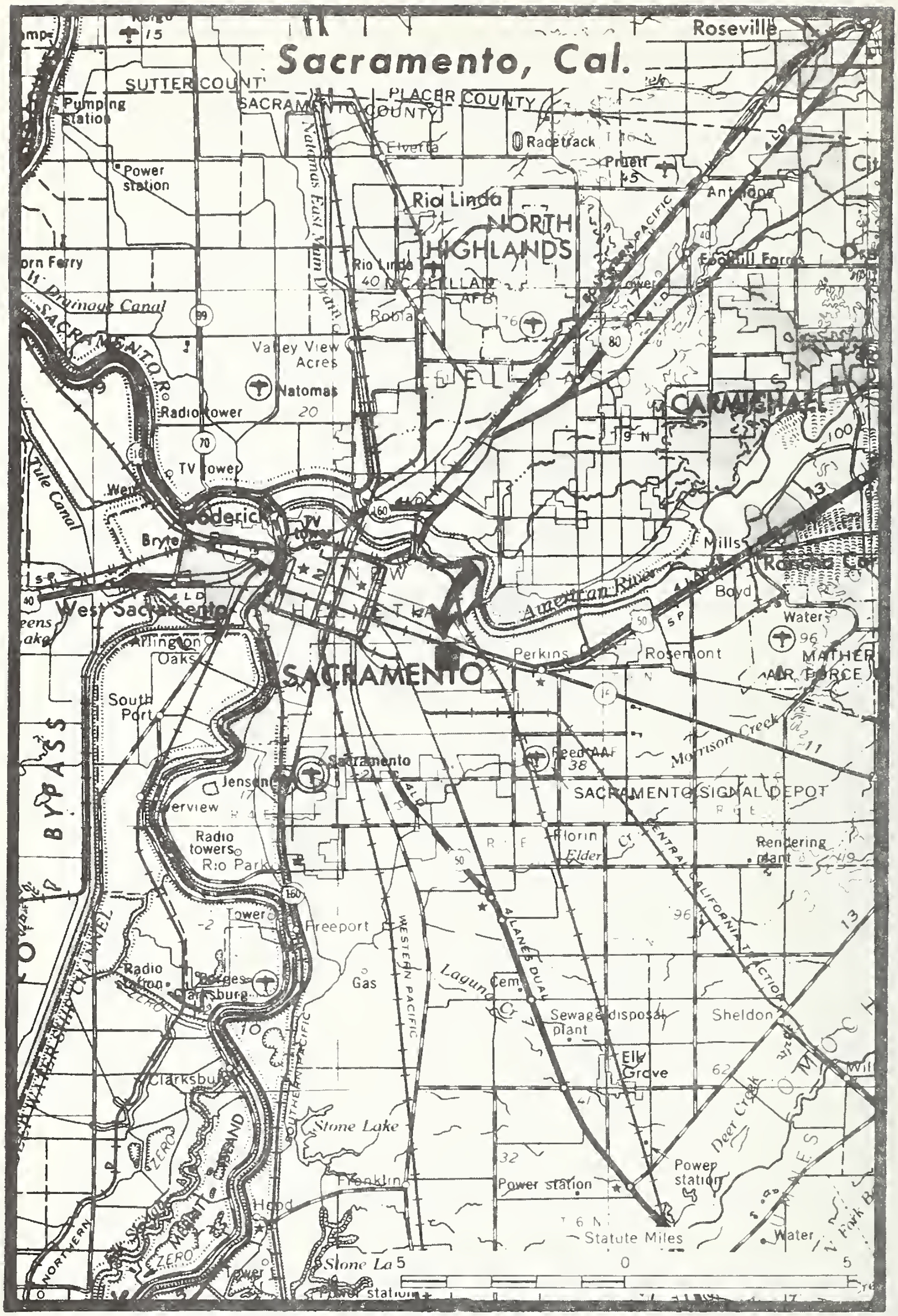
Appendix

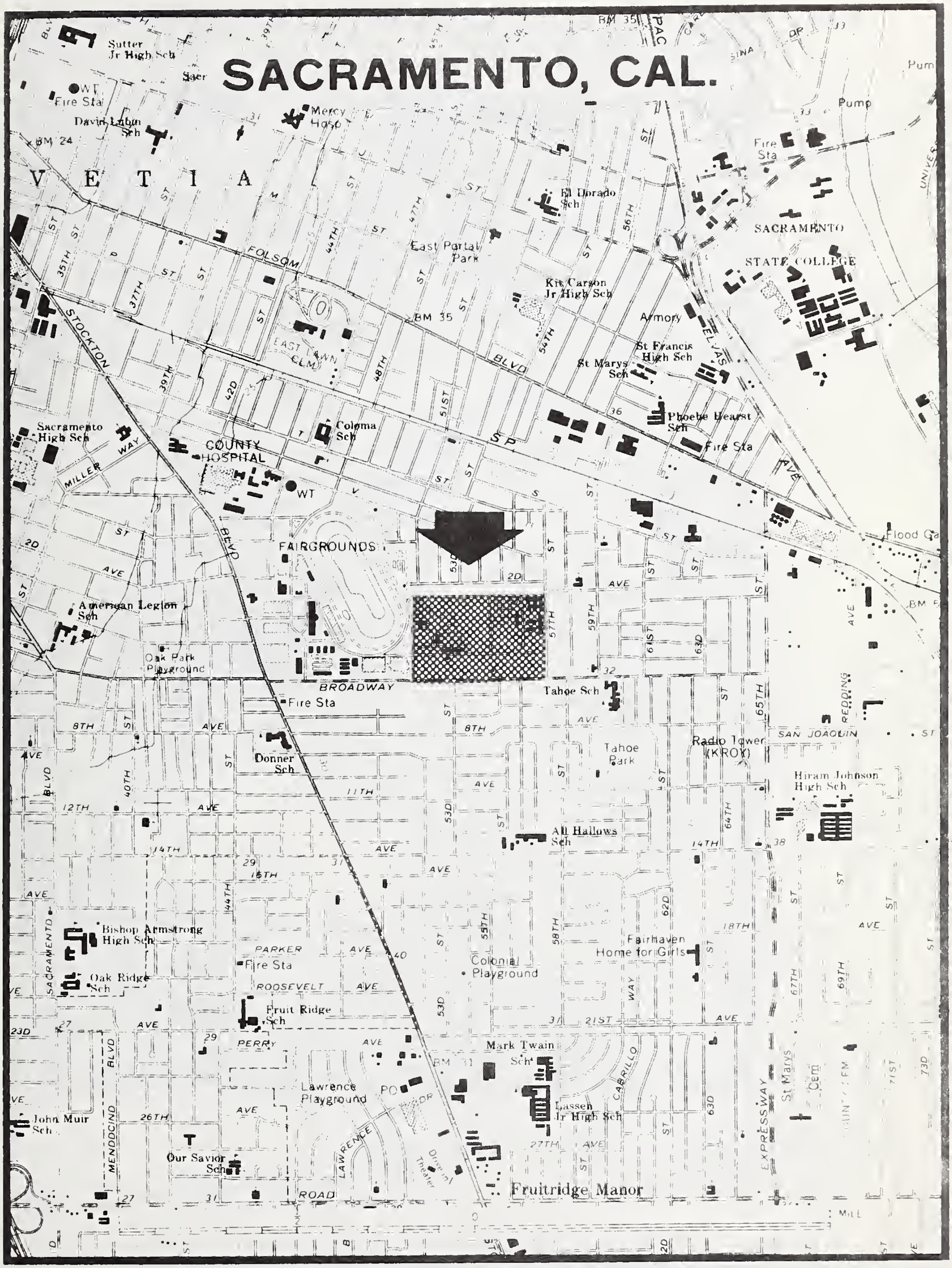
City Maps for the Breakthrough Sites

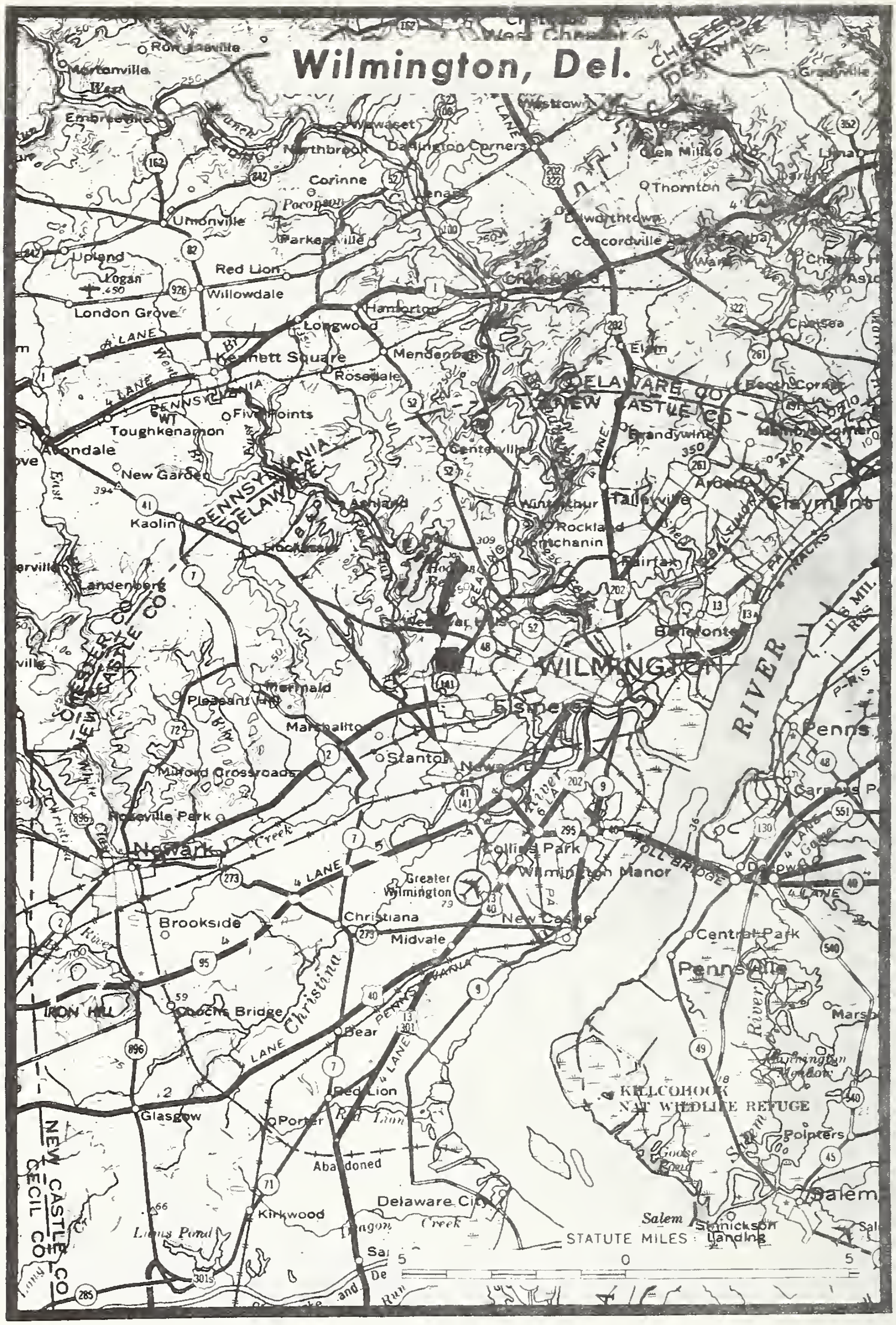
▨ ■ Breakthrough Site

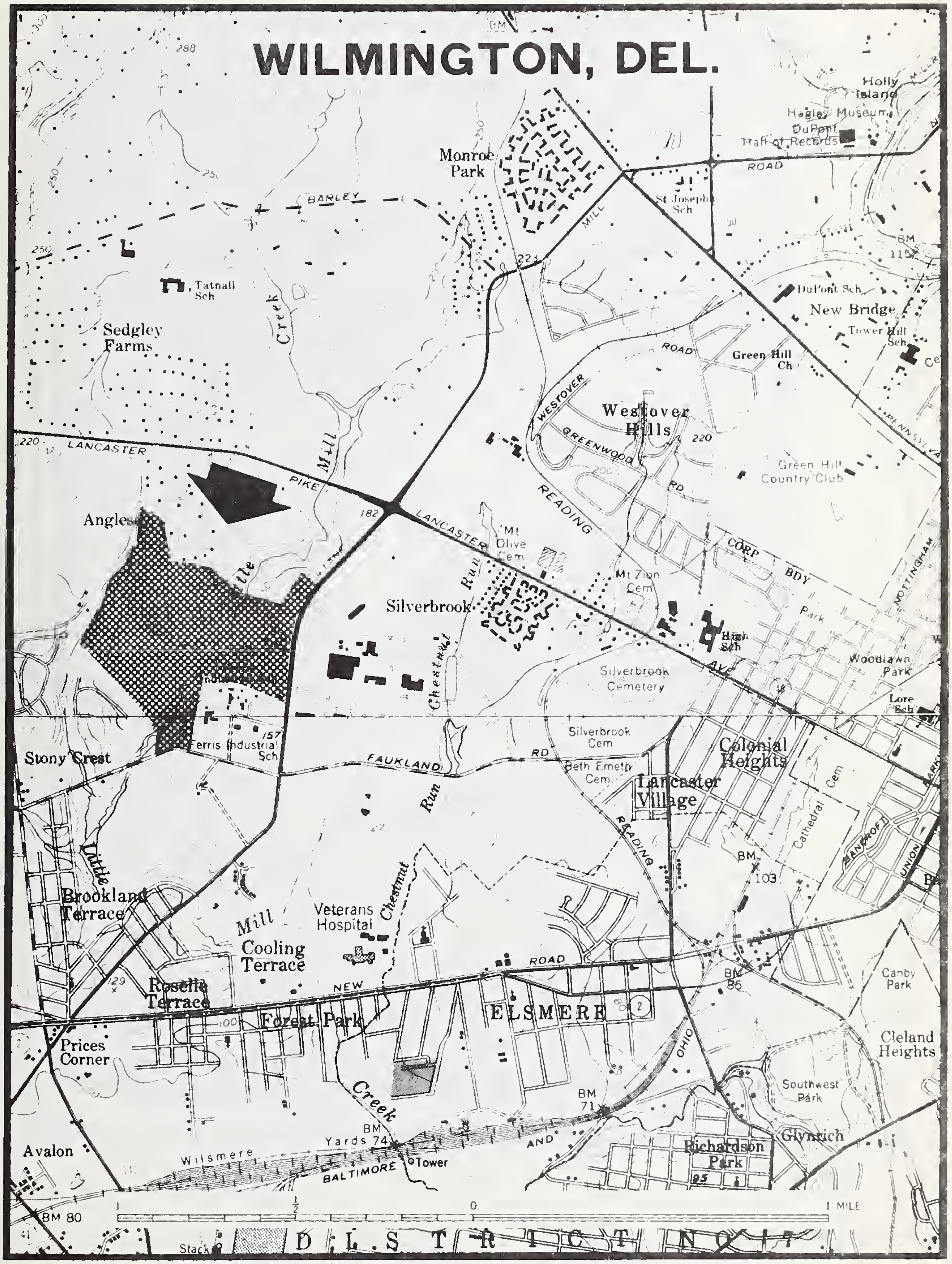
✈ Airport

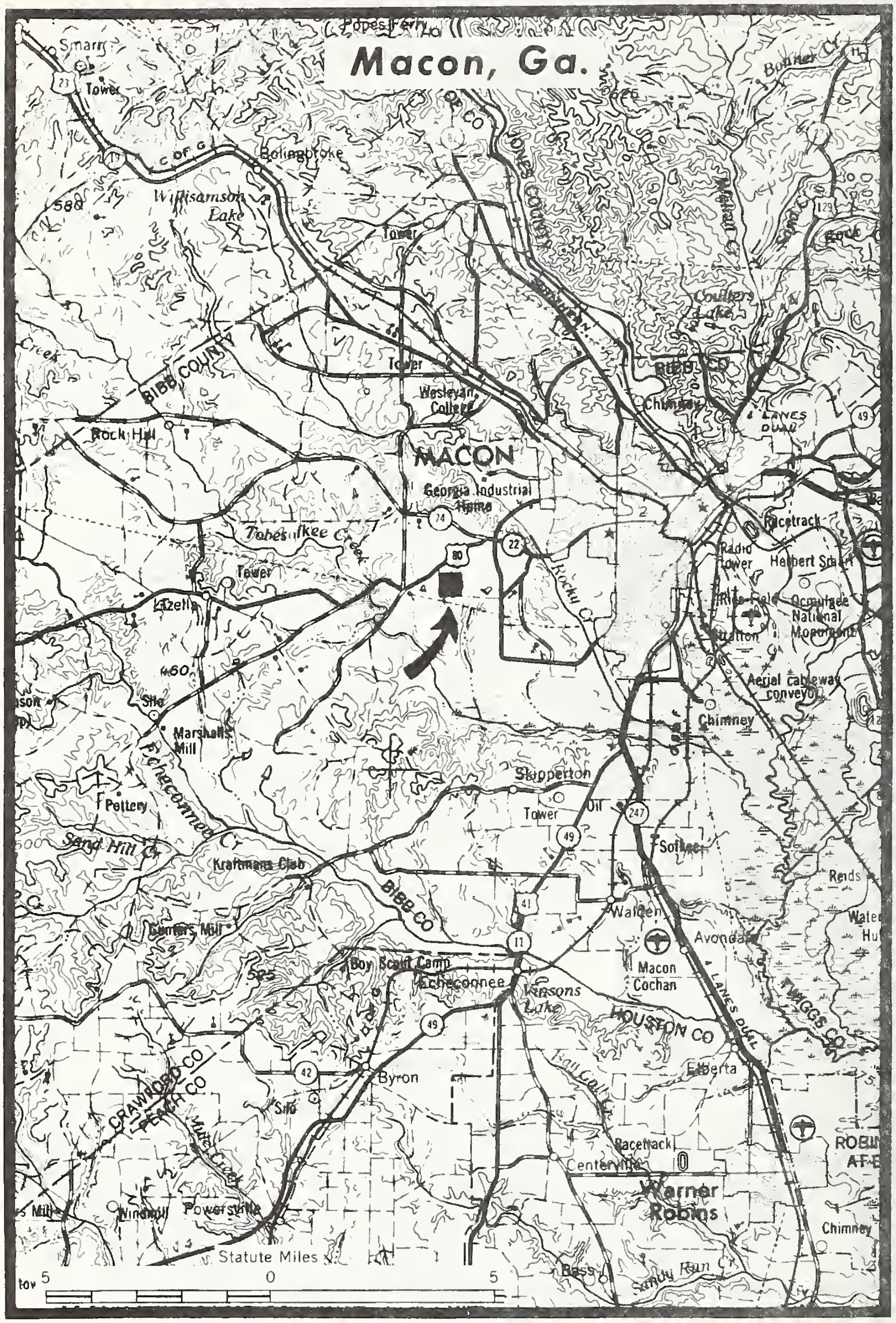
○ Weather Data Station

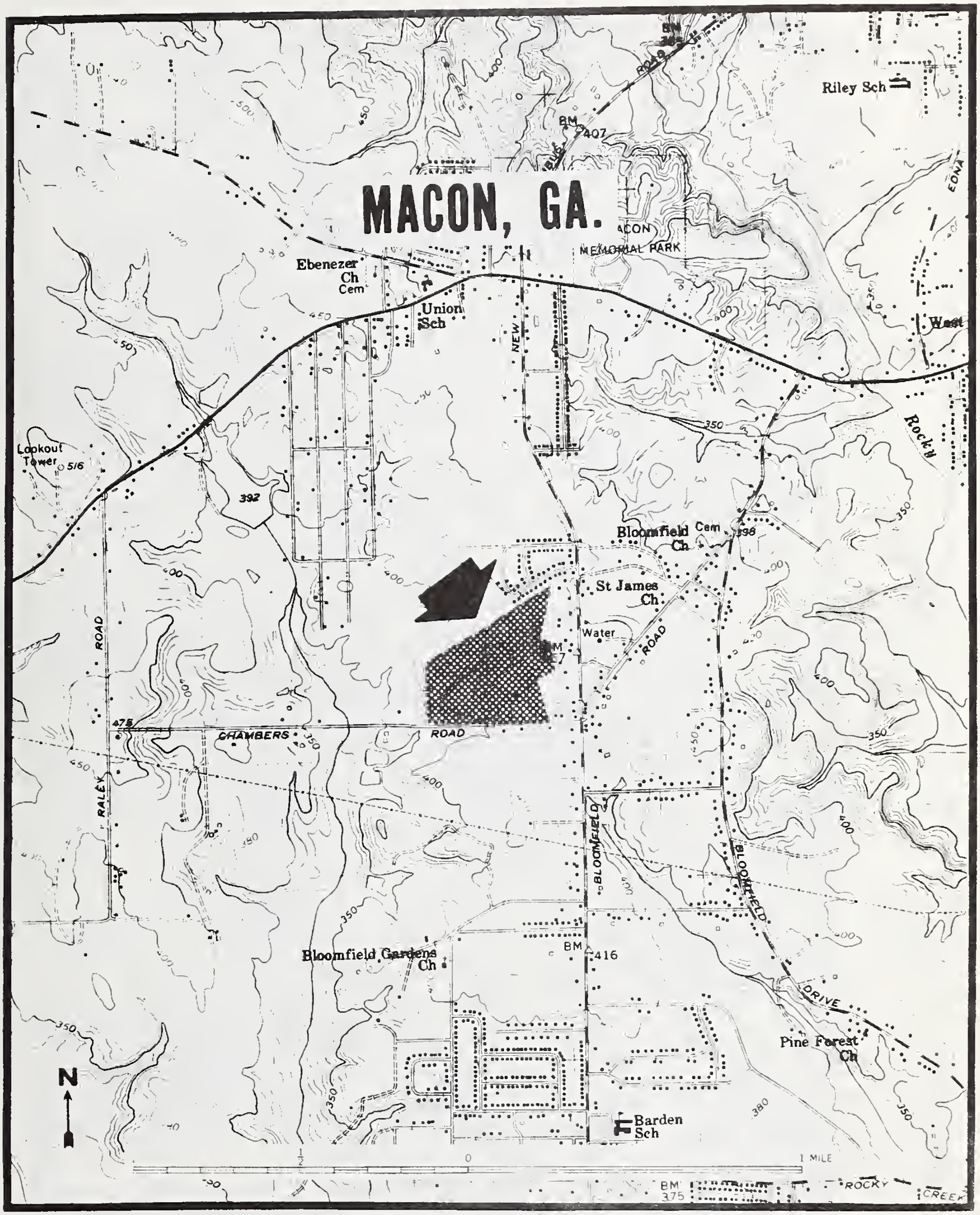

Sacramento, Cal.
SUTTER COUNTY
SACRAMENTO COUNTY
PLACER COUNTY
Roseville
Pumping Station
Power station
Elverta
Racetrack
Pruett
Antelope
Rio Linda
NORTH HIGHLANDS
Rio Linda
McCLELLAN AFB
Robla
Foothill Farms
Natomas East Main Drain
Drainage Canal
Valley View Acres
Natomas
Radio tower
TV tower
CARMICHAEL
Tule Canal
Broderick
Bryte
West Sacramento
Arlington Oaks
SACRAMENTO
American River
Perkins
Rosemont
Mills
Boyd
MATHER AIR FORCE
Morrison Creek
South Port
BYPASS
Sacramento
Jensen
Riverview
Radio towers
Rio Park
Reed AAF
SACRAMENTO SIGNAL DEPOT
Florin
Elder Cr.
CENTRAL CALIFORNIA TRACTION
Rendering plant
Freeport
WESTERN PACIFIC
SOUTHERN PACIFIC
Laguna Cr.
4 LANES DUAL
Gas
Cem
Sewage disposal plant
Sheldon
Elk Grove
Deer Creek
Radio station
Clarksburg
Stone Lake
Franklin
Hood
Power station
Power station
NORTHERN
Water
Statute Miles
5 0 5


SACRAMENTO, CAL.
Sutter Jr High Sch
WT
Fire Sta
David Lubin Sch
Mercy Hosp
BM 24
V E T I A
El Dorado Sch
Fire Sta
Pump
SACRAMENTO STATE COLLEGE
FOLSOM
BLVD
East Portal Park
Kit Carson Jr High Sch
Armory
BM 35
EAST LAWN CEM
St Francis High Sch
St Marys Sch
ELVAS
STOCKTON
Phoebe Hearst Sch
Fire Sta
Sacramento High Sch
MILLER WAY
COUNTY HOSPITAL
Coloma Sch
WT
SP
FAIRGROUNDS
Flood Ga
American Legion Sch
Oak Park Playground
BROADWAY
Fire Sta
Tahoe Sch
Tahoe Park
Radio Tower (KROY)
SAN JOAQUIN
REDDING
Donner Sch
Hiram Johnson High Sch
All Hallows Sch
Bishop Armstrong High Sch
PARKER AVE
Fire Sta
ROOSEVELT AVE
Oak Ridge Sch
SACRAMENTO BLVD
Fruit Ridge Sch
Colonial Playground
Fairhaven Home for Girls
PERRY AVE
Mark Twain Sch
CABRILLO
Lawrence Playground
PO
Lassen Jr High Sch
John Muir Sch
MENDOCINO BLVD
Our Savior Sch
LAWRENCE
Drive-in Theater
EXPRESSWAY
St Marys Cem
Fruitridge Manor
ROAD
MILL


Wilmington, Del.
WILMINGTON
Newark
Kennett Square
New Castle
Elsmere
Claymont
Pennsville
Salem
Greater Wilmington
DELAWARE CO.
NEW CASTLE CO.
CHESTER CO.
PENNSYLVANIA
DELAWARE
RIVER
STATUTE MILES
5
0
5
KILLCOHOOK NAT WILDLIFE REFUGE
NEW CASTLE CO.
CECIL CO.


WILMINGTON, DEL.
Holly Island
Hagley Museum
DuPont Hall of Records
ROAD
Monroe Park
BARLEY
MILL
St Joseph Sch
BM 115
DuPont Sch
New Bridge
Tower Hill Sch
Tatnall Sch
Sedgley Farms
Creek
Green Hill Ch
ROAD
WESTOVER
Westover Hills
GREENWOOD
RD
Green Hill Country Club
LANCASTER
PIKE
Mill
220
182
LANCASTER
READING
Mt Olive Cem
Run
Mt Zion Cem
CORP
BDY
NOTTINGHAM
Park
Silverbrook
Chestnut
High Sch
Woodlawn Park
Silverbrook Cemetery
AVE
Lore Sch
157
Ferris Industrial Sch
Stony Crest
FAUKLAND
RD
Silverbrook Cem
Beth Emeth Cem
Colonial Heights
Lancaster Village
Cathedral Cem
READING
BM 103
UNION
Little
Brookland Terrace
Mill
Veterans Hospital
Chestnut
Cooling Terrace
ROAD
NEW
129
Roselle Terrace
Forest Park
ELSMERE
2
BM 85
Canby Park
Prices Corner
OHIO
Cleland Heights
Southwest Park
Creek
BM 71
BM Yards 74
Glynrich
Avalon
Wilsmere
AND
BALTIMORE
Tower
Richardson Park
95
BM 80
1
½
0
1 MILE
Stack
DISTRICT NO. 17


Macon, Ga.
Popes Ferry
Smarr
Tower
Bolingbroke
C OF G
Williamson Lake
580
Tower
Tower
BIBB COUNTY
Creek
Wesleyan College
Rock Hill
MACON
Georgia Industrial Home
Tobesofkee Creek
Tower
Lizella
460
Silo
Marshalls Mill
Echeconnee Cr
Pottery
Sand Hill Cr
Kraftmans Club
Dunlaps Mill
Boy Scout Camp
Echeconnee
BIBB CO
CRAWFORD CO
PEACH CO
Mule Creek
Silo
Byron
Windmill
Powersville
Statute Miles
5
0
5
Chimney
BIBB CO
JONES COUNTY
Coulters Lake
4 LANES DUAL
Racetrack
Radio Tower
Herbert Smart
Ocmulgee National Monument
Aerial cableway conveyor
Chimney
Skipperton
Tower
Oil
Sofkee
Reids
Walden
Avondale
Macon Cochran
Vinsons Lake
HOUSTON CO
4 LANES DUAL
TWIGGS CO
Elberta
Racetrack
Centerville
Warner Robins
ROBINS AFB
Chimney
Bass
Sandy Run Cr
Rocky Cr
74
80
22
49
247
41
11
42
49
23
129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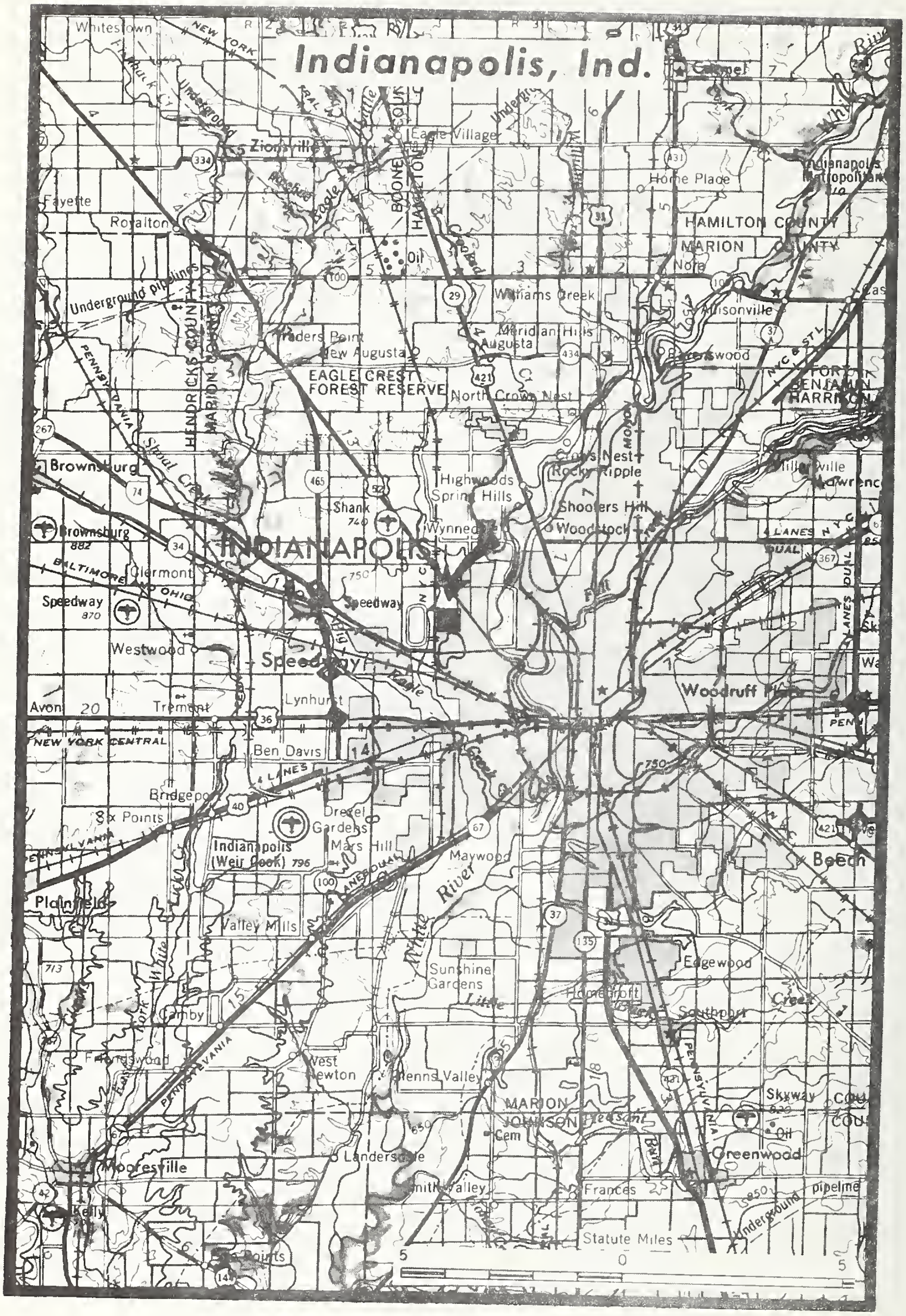
Ebenezer Ch Cem
Union Sch
MEMORIAL PARK
NEW
West
Rocky
Lookout Tower
Bloomfield Ch
Cem
St James Ch
Water
ROAD
RALEY ROAD
CHAMBERS ROAD
BLOOMFIELD
BLOOMFIELD
Bloomfield Gardens Ch
BM 416
DRIVE
Pine Forest Ch
Barden Sch
N
1/2
0
1 MILE
BM 375
ROCKY CREEK


Indianapolis, Ind.
Whitestown
NEW YORK
Zionsville
Eagle Village
BOONE
HAMILTON
Carmel
Home Place
Indianapolis Metropolitan
HAMILTON COUNTY
MARION COUNTY
Nora
Allisonville
Fayette
Royalton
Oil
Williams Creek
Meridian Hills
Augusta
Underground pipelines
Traders Point
New Augusta
EAGLE CREST FOREST RESERVE
North Crows Nest
Ravenswood
FORT BENJAMIN HARRISON
HENDRICKS COUNTY
MARION COUNTY
PENNSYLVANIA
Brownsburg
Brownsburg 882
Crows Nest
Rocky Ripple
Millersville
Lawrence
Highwoods
Spring Hills
Shank 740
Shooters Hill
Wynnedale
Woodstock
INDIANAPOLIS
BALTIMORE & OHIO
Clermont
Speedway 870
Speedway
Westwood
Speedway
Fall
Woodruff Place
Lynhurst
Avon
Tremont
NEW YORK CENTRAL
Ben Davis
4 LANES
Bridgeport
Six Points
Drexel Gardens
Mars Hill
Indianapolis (Weir Cook) 796
Maywood
White River
Beech
Plainfield
Valley Mills
Sunshine Gardens
Edgewood
Homecroft
Southport
Little
Creek
Camby
Friendswood
West Newton
Glenns Valley
MARION
JOHNSON
Pleasant
Skyway 820
Oil
Greenwood
Cem
Mooresville
Landersdale
Smith Valley
Frances
Underground
pipeline
Kelly
Five Points
Statute Miles
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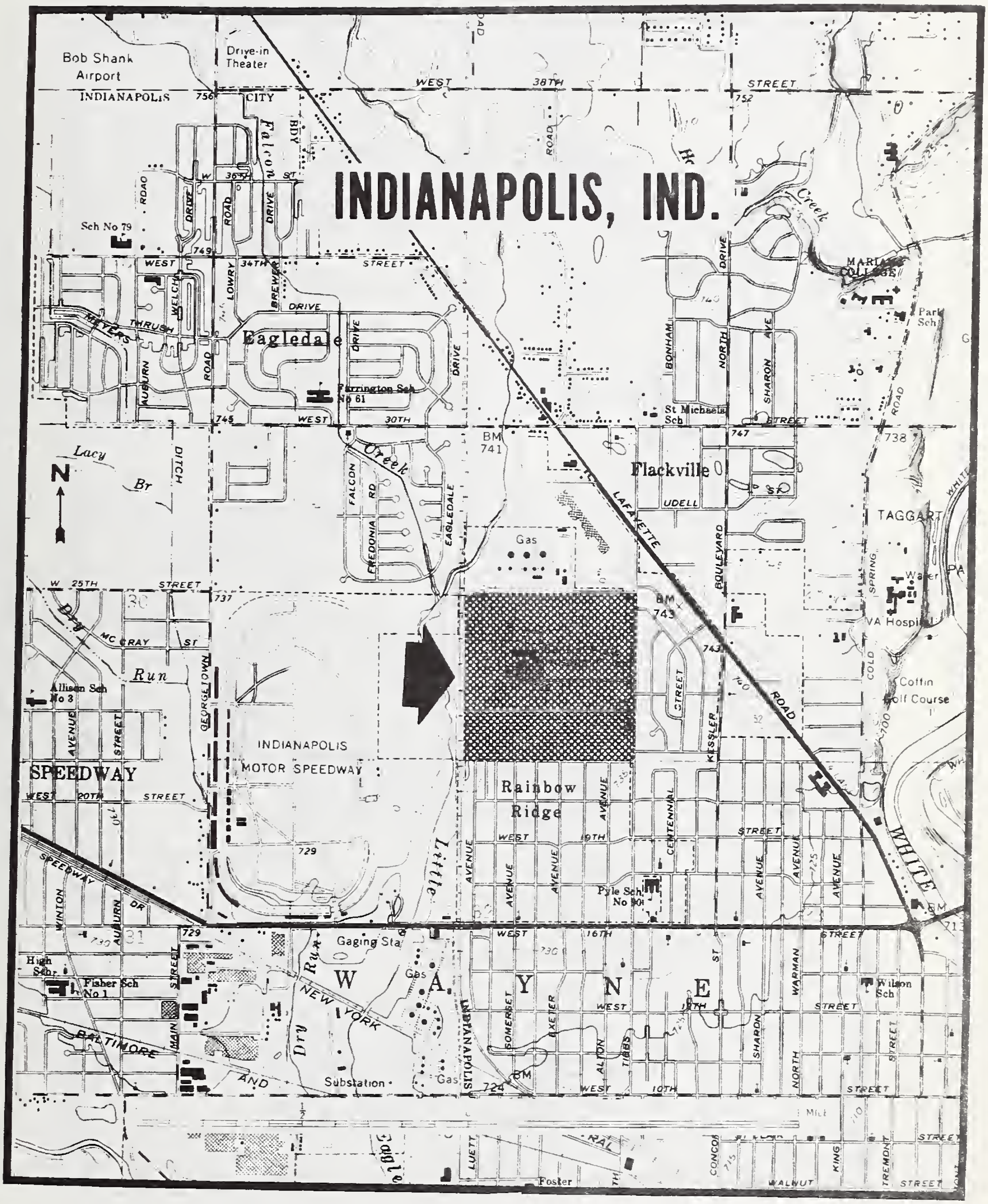
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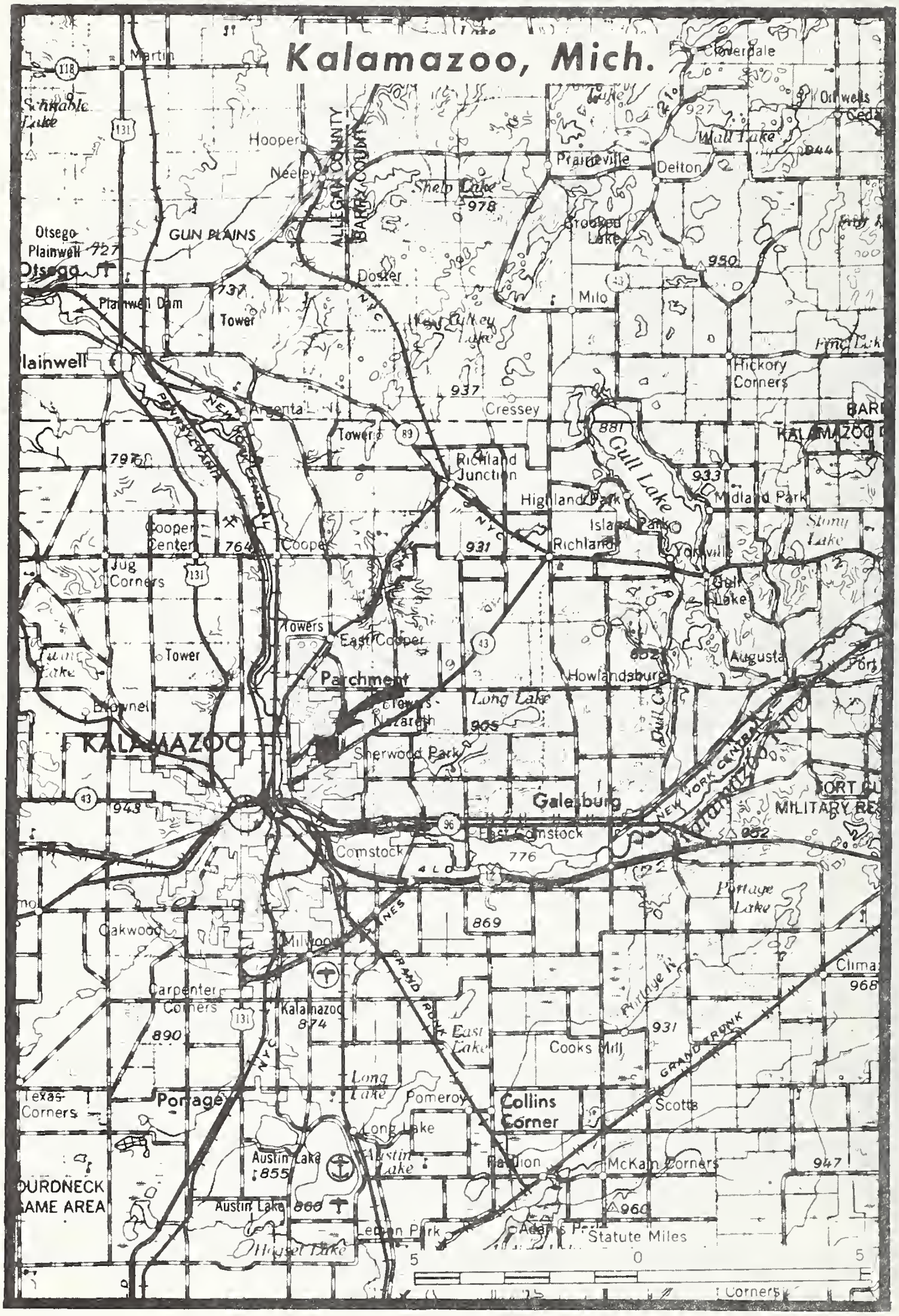
Bob Shank Airport
Drive-in Theater
INDIANAPOLIS CITY BDY
WEST 38TH STREET
Falcon Creek
Sch No 79
W 36TH ST
WEST 34TH STREET
Eagledale
Farrington Sch No 61
WEST 30TH STREET
Flackville
St Michaels Sch
UDELL
LAFAYETTE ROAD
Marian College
Park Sch
TAGGART
VA Hospital
Coffin Golf Course
Gas
Lacy Br
DITCH
N
W 25TH STREET
Dry Run
MC CRAY ST
Allison Sch No 3
GEORGETOWN
INDIANAPOLIS MOTOR SPEEDWAY
SPEEDWAY
WEST 20TH STREET
Rainbow Ridge
WEST 19TH STREET
Little Eagle Creek
Pyle Sch No 90
CENTENNIAL
KESSLER BOULEVARD
SPEEDWAY DR
WEST 16TH STREET
Gaging Sta
High Schr
Fisher Sch No 1
W A Y N E
NEW YORK
BALTIMORE AND
Substation
Gas
Wilson Sch
WEST 10TH STREET
WHITE
Foster
WALNUT STREET


Kalamazoo, Mich.
Martin
Cloverdale
Oil wells
Hooper
Neeley
ALLEGAN COUNTY
BARRY COUNTY
Shelp Lake
978
Prairieville
Delton
Wall Lake
944
927
Crooked Lake
950
Otsego
Plainwell
727
GUN PLAINS
Doster
737
Tower
Plainwell Dam
Milo
Hickory Corners
Plainwell
Argenta
Tower
937
Cressey
881
BARRY
KALAMAZOO
797
Richland Junction
Gull Lake
933
Midland Park
Highland Park
Island Park
Stony Lake
Cooper Center
764
Cooper
931
Richland
Yorkville
Jug Corners
Gull Lake
Towers
East Cooper
Tower
852
Augusta
Parchment
Howlandsburg
Long Lake
905
Nazareth
Brownell
KALAMAZOO
Sherwood Park
Galesburg
943
FORT CUSTER MILITARY RES.
852
East Comstock
Comstock
776
Portage Lake
869
Oakwood
Milwood
Carpenter Corners
Kalamazoo
874
890
931
Climax
968
East Lake
Cooks Mill
Long Lake
Texas Corners
Portage
Pomeroy
Collins Corner
Scotts
Long Lake
Austin Lake
855
Austin Lake
Fulton
McKain Corners
947
GOURDNECK GAME AREA
Austin Lake
860
960
Lemon Park
Adams Park
Hogset Lake
Statute Miles
5
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5
Corners
NEW YORK CENTRAL
PENNSYLVANIA
NYC
GRAND TRUNK
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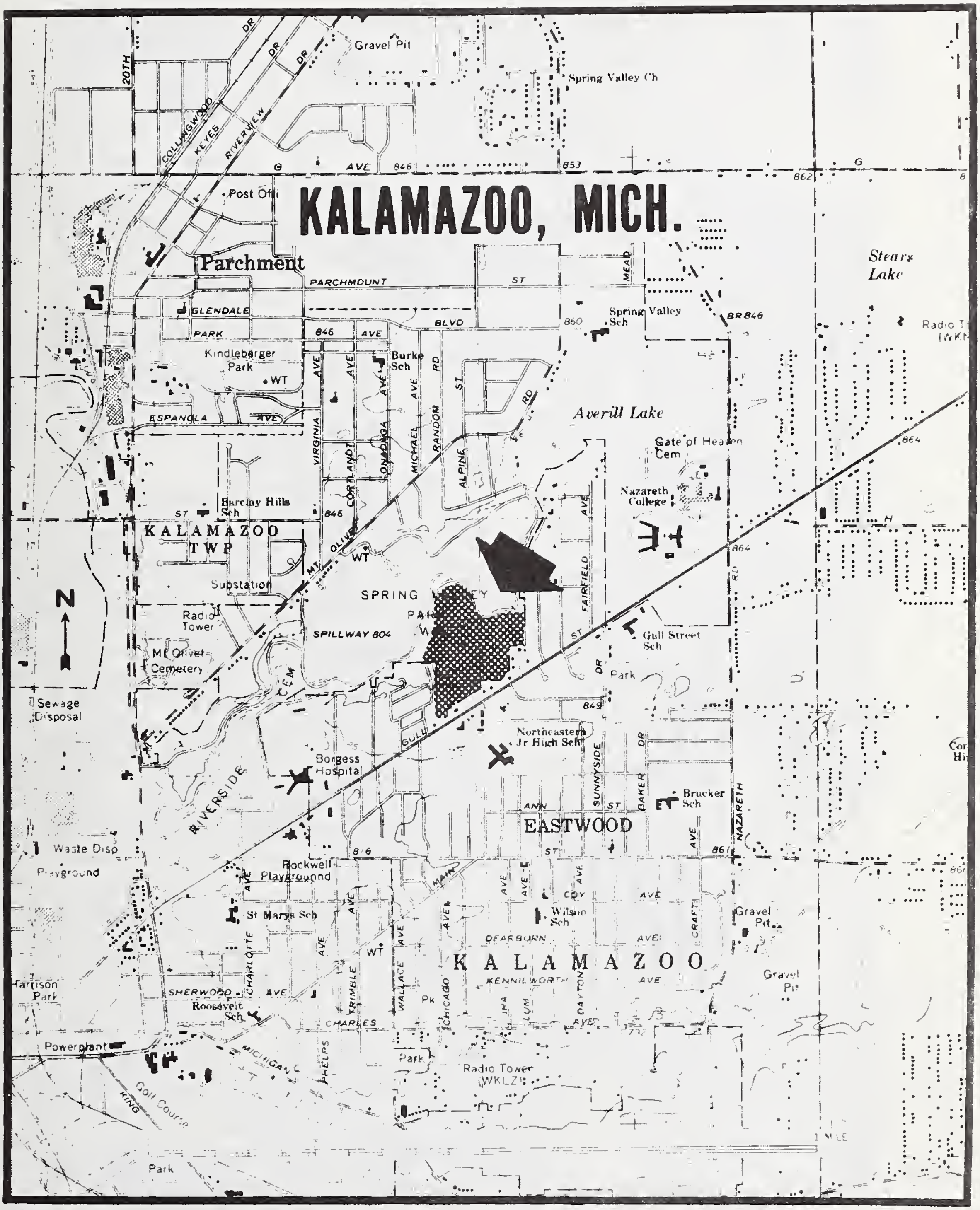
131
89
43
96


KALAMAZOO, MICH.
Parchment
Post Offi
Gravel Pit
Spring Valley Ch
Stears Lake
Radio T (WKN
Spring Valley Sch
Kindleberger Park
Burke Sch
Averill Lake
Gate of Heaven Cem
Nazareth College
KALAMAZOO TWP
Barclay Hills Sch
Substation
SPRING VALLEY PARK
SPILLWAY 804
Radio Tower
Mt Olivet Cemetery
Sewage Disposal
Gull Street Sch
Park
Northeastern Jr High Sch
Borgess Hospital
Brucker Sch
EASTWOOD
Waste Disp
Playground
Rockwell Playground
St Marys Sch
Wilson Sch
Gravel Pit
KALAMAZOO
Harrison Park
Roosevelt Sch
Powerplant
Radio Tower (WKLZ)
Golf Course
Park
N
PARCHMOUNT ST
GLENDALE
PARK
846 AVE BLVD
ESPANOLA AVE
G AVE
VIRGINIA AVE
CORTLANDT AVE
LONDONGA AVE
MICHAEL AVE
RANDOM RD
ALPINE ST
MT OLIVET RD
RIVERSIDE
GULL
SUNNYSIDE DR
BAKER DR
NAZARETH RD
FAIRFIELD AVE
ANN ST
MAIN
CHARLOTTE AVE
SHERWOOD AVE
CHARLES
PHELPS
TRIMBLE AVE
WALLACE AVE
CHICAGO AVE
DEARBORN AVE
KENNILWORTH AVE
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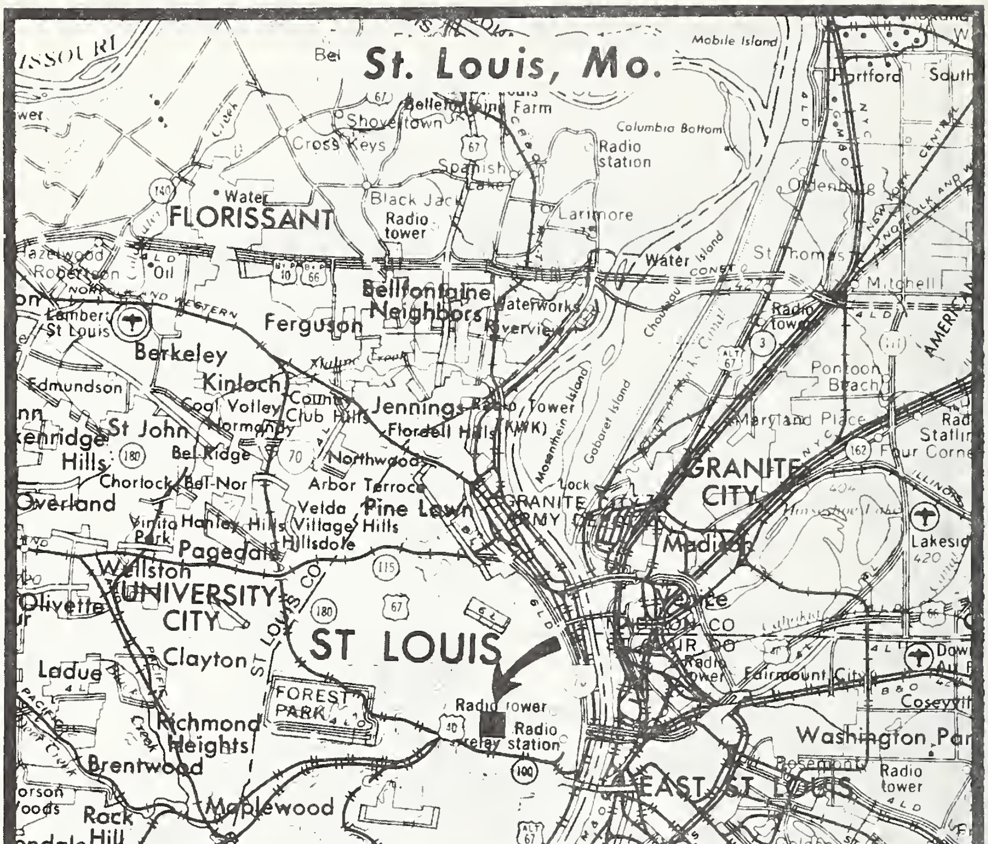
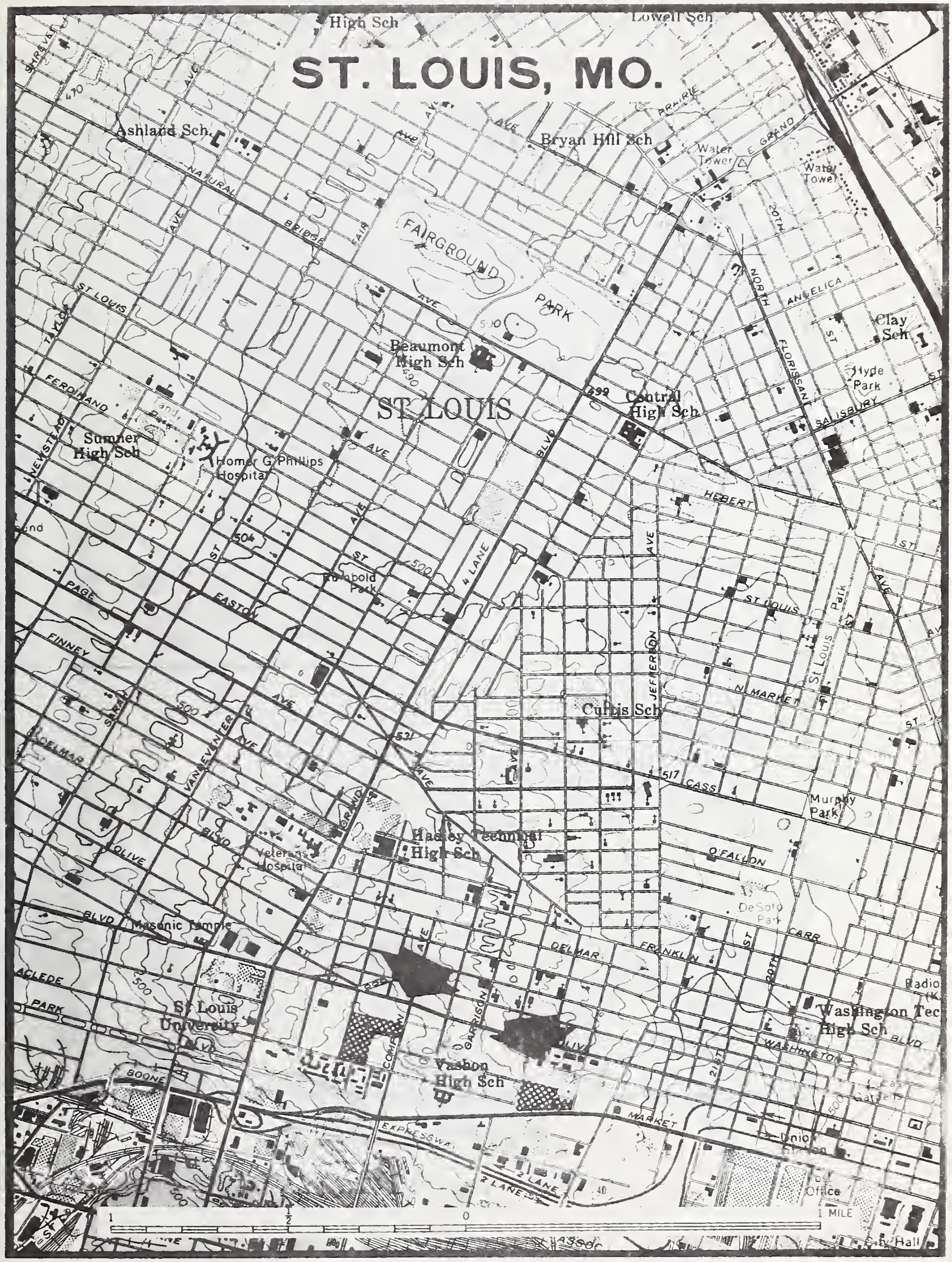
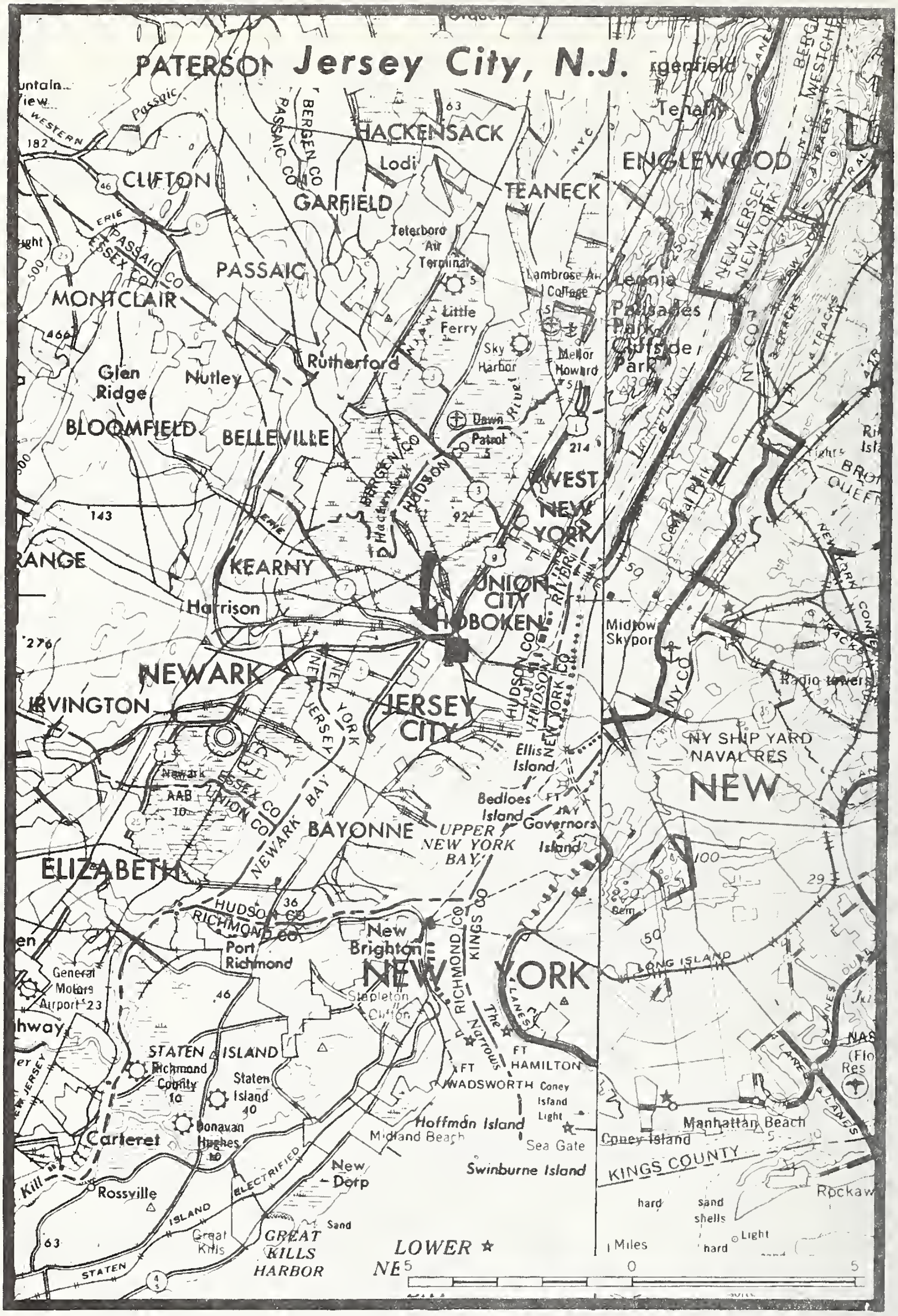
CRAFT
MICHIGAN
KING
20TH
COLLINGWOOD
KEYES
RIVERVIEW DR
MEAD
BR 846
WT


St. Louis, Mo.
Mobile Island
Hartford
South
Bellefontaine Farm
Shoveltown
Cross Keys
Columbia Bottom
Radio station
Spanish Lake
Black Jack
Radio tower
Larimore
Water
FLORISSANT
Oldenburg
Hazelwood
Robertson
Oil
Water Island
St Thomas
Mitchell
Bellfontaine Neighbors
Waterworks
Riverview
Lambert-St Louis
Ferguson
Radio tower
Berkeley
Kinloch
Pontoon Beach
Edmundson
Country Club Hills
Jennings
Radio tower (KWK)
Coal Valley
Normandy
Flordell Hills
Mosenthein Island
Gabaret Island
Maryland Place
St John
Stallings
Breckenridge Hills
Bel-Ridge
Northwoods
Four Corners
Chorlock
Bel-Nor
Arbor Terrace
Lock
GRANITE CITY
Overland
Velda Village Hills
Pine Lawn
GRANITE CITY ARMY DEPOT
Vinita Park
Hanley Hills
Hillsdale
Pagedale
Madison
Lakeside
Wellston
UNIVERSITY CITY
Olivette
Venice
ST LOUIS
Clayton
Ladue
Radio tower
Fairmount City
FOREST PARK
Radio tower
Radio station
Richmond Heights
Washington Park
Brentwood
Radio tower
EAST ST LOUIS
Rosemont
Maplewood
Rock Hill
Webster Groves
Golden Gardens
Radio tower
Shrewsbury
Monsanto
Fireworks
Signal Hill
T V tower
Maplewood Park
Crestwood
Marlborough
Cahokia
Parks College
Grantwood
Arsenal Island
Centreville
Wilbur Park
Bella Villa
Affton
Prairie du Pont
Lakeshire
East Carondelet
Stolle
Radio tower
T V tower
St George
Luxemburg
Radio tower
Falling Spring
BELLE
Flying Dutchmen
JEFFERSON BARRACKS
Mehlville
Dupo
Numerous small depressions
Mattese
Sugarloaf
Oil field
Cem
Phelps
Oakville
Strip mines
Millstadt
River
Cliff Cave
Columbia
Arnold
Ten Brook
Statute Miles
5
0
5
Strip mines
MISSOURI
ILLINOIS
RIVER
BOTTOMS
AMERICAN BOTTOMS
MISSOURI PACIFIC
GULF MOBILE AND OHIO
SOUTHERN
ILLINOIS CENTRAL
NEW YORK CENTRAL
NORFOLK AND WESTERN
NORFOLK AND WESTERN
CONST



ST. LOUIS, MO.

High Sch
Lowell Sch
Ashland Sch
Bryan Hill Sch
Water Tower
E GRAND
Water Tower
NATURAL
BRIDGE
FAIRGROUND PARK
ST LOUIS
TAYLOR
AVE
PRAIRIE
20TH
NORTH
ANGELICA
Clay Sch
FLORISSANT
Hyde Park
SALISBURY
Beaumont High Sch
ST LOUIS
599
Central High Sch
FERDINAND
Sumner High Sch
Homer G Phillips Hospital
NEWSTEAD
BLVD
HEBERT
504
PAGE
EASTON
Rumbold Park
4 LANE
500
ST LOUIS
Park
FINNEY
JEFFERSON
N MARKET
St Louis
Curtis Sch
DELMAR
SARAH
VANDEVENTER
531
GRAND
517
CASS
Murphy Park
Hadley Technical High Sch
Veterans Hospital
OLIVE
BLVD
O'FALLON
DeSoto Park
Masonic Temple
DELMAR
FRANKLIN
CARR
LACLEDE
PARK
St Louis University
GARRISON
COMPTON
Washington Tech High Sch
WASHINGTON
OLIVE
Vashon High Sch
BOONE
21ST
20TH
MARKET
EXPRESSWAY
2 LANE
Union Station
Post Office
Radio
City Hall
1
½
0
1 MILE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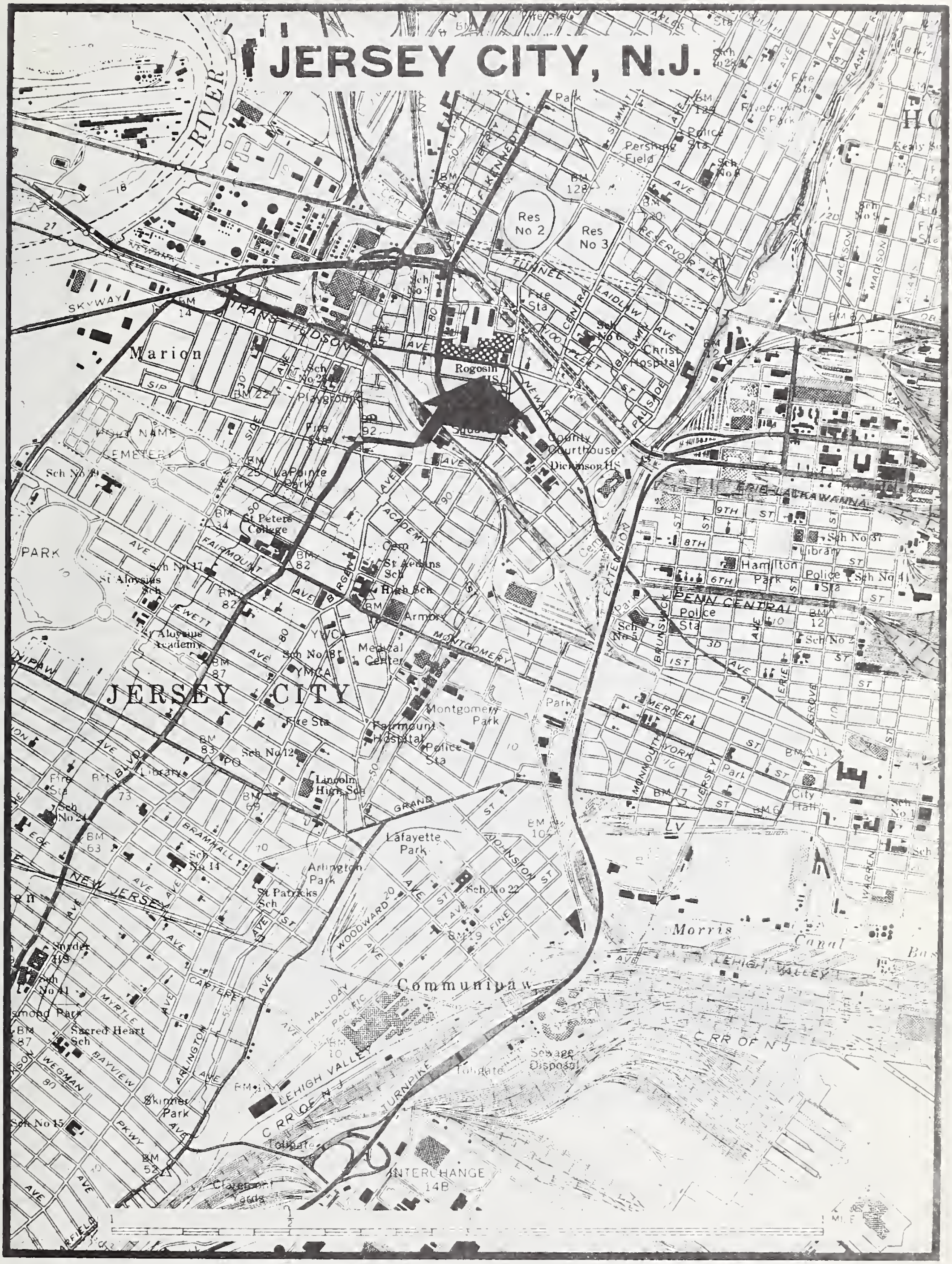
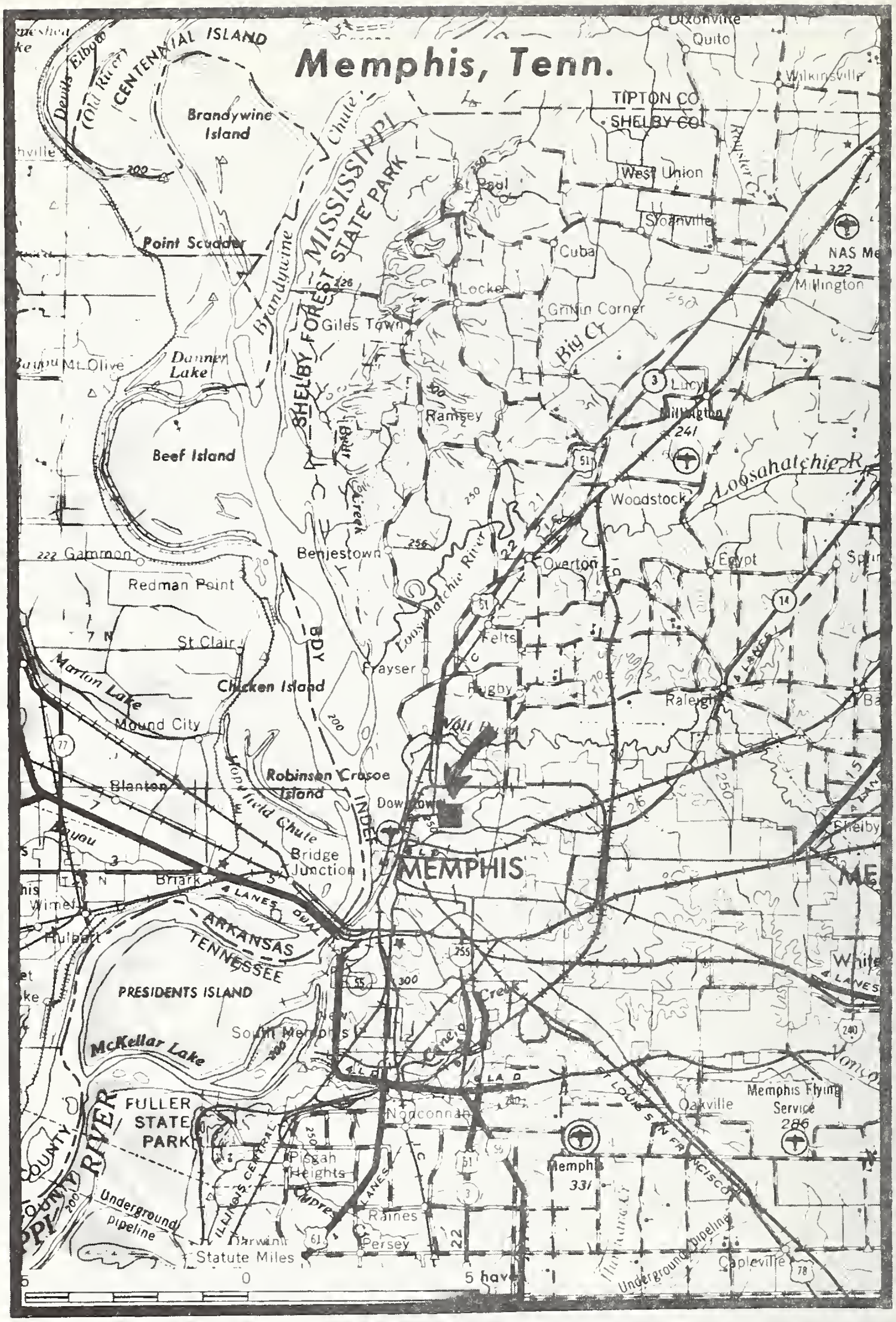
PATERSON
CLIFTON
PASSAIC
MONTCLAIR
Glen Ridge
Nutley
BLOOMFIELD
BELLEVILLE
Rutherford
HACKENSACK
Lodi
GARFIELD
TEANECK
Teterboro Air Terminal
Little Ferry
Sky Harbor
Lambrose Air College
Mellor Howard
Dawn Patrol
ENGLEWOOD
Tenafly
Leonia
Palisades Park
Cliffside Park
NEW JERSEY
NEW YORK
WEST NEW YORK
UNION CITY
HOBOKEN
KEARNY
Harrison
NEWARK
IRVINGTON
Newark AAB
ELIZABETH
BAYONNE
NEWARK BAY
JERSEY CITY
Ellis Island
Bedloes Island
Governors Island
UPPER NEW YORK BAY
Midtown Skyport
Central Park
Radio towers
NY SHIP YARD NAVAL RES
NEW
New Brighton
Port Richmond
NEW YORK
Stapleton
Clifton
STATEN ISLAND
Richmond County
Staten Island
Bonavan Hughes
General Motors Airport
Carteret
Rossville
The Narrows
FT WADSWORTH
FT HAMILTON
Hoffman Island
Swinburne Island
Midland Beach
New Dorp
Great Kills
GREAT KILLS HARBOR
Sea Gate
Coney Island
Manhattan Beach
KINGS COUNTY
LOWER
Miles
5 0 5


JERSEY CITY, N.J.
RIVER
SKYWAY
TRANS-HUDSON
Marion
Res No 2
Res No 3
Pershing Field
Reservoir Ave
Tunnel
Rogosin HS
Square
County Courthouse
Dickinson HS
Christ Hospital
Erie-Lackawanna
Hamilton Park
Penn Central
Holy Name Cemetery
LaPointe Park
St Peters College
St Aloysius Sch
Aloysius Academy
St Aedans Sch
High Sch
Armory
Medical Center
YMCA
JERSEY CITY
Montgomery Park
Fairmount Hospital
Police Sta
Lincoln High Sch
Library
City Hall
Lafayette Park
Arlington Park
St Patricks Sch
Sch No 22
Communipaw
Morris Canal
Lehigh Valley
C RR of N J
Turnpike
Tollgate
Sewage Disposal
Interchange 14B
Skinner Park
Snyder HS
Sacred Heart Sch
Fairmount Ave
Montgomery
Grand
New Jersey
Bramhall
Carteret
Myrtle
Bayview
Wegman Pkwy
Woodward
Johnston
Jewett
Newark
Palisade
Baldwin
Laidlaw
Central
Summit
Kennedy
Academy
Bergen
West Side
Extension
Mercer
York
Jersey
Monmouth
Brunswick
Erie
Grove
Warren
Mile


Memphis, Tenn.
CENTENNIAL ISLAND
Devils Elbow
(Old River)
Brandywine Island
Chute
MISSISSIPPI
STATE PARK
SHELBY FOREST
Brandywine
Point Scudder
Danner Lake
Mt Olive
Beef Island
Gammon
Redman Point
St Clair
Marion Lake
Mound City
Chicken Island
Robinson Crusoe Island
Blanton
Hopefield Chute
Bridge Junction
Briark
Wimet
Hulbert
ARKANSAS
TENNESSEE
4 LANES
PRESIDENTS ISLAND
McKellar Lake
South Memphis
FULLER STATE PARK
RIVER
Underground Pipeline
Statute Miles
5
0
5
Darwin
Pisgah Heights
ILLINOIS CENTRAL
Raines
Persey
Nonconnah
MEMPHIS
Downtown
Frayser
Rugby
Felts
Benjestown
Loosahatchie River
Overton
Woodstock
Ramsey
Giles Town
Locke
St Paul
Cuba
Griffin Corner
Big Cr
West Union
Sloanville
Dixonville
Quito
Wilkinsville
TIPTON CO
SHELBY CO
NAS Me
Millington
Lucy
Loosahatchie R
Egypt
Raleigh
Shelby
Memphis Flying Service
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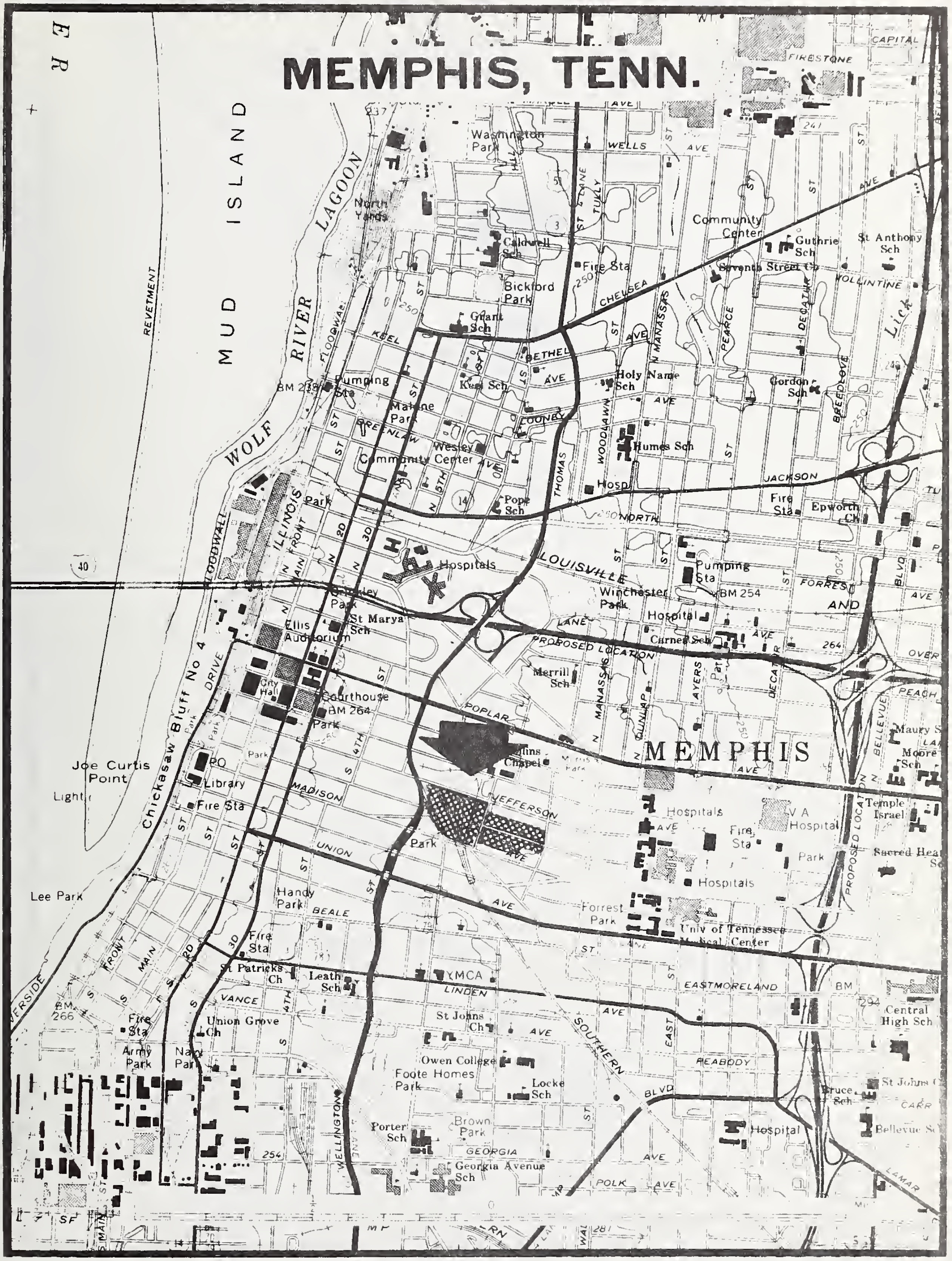
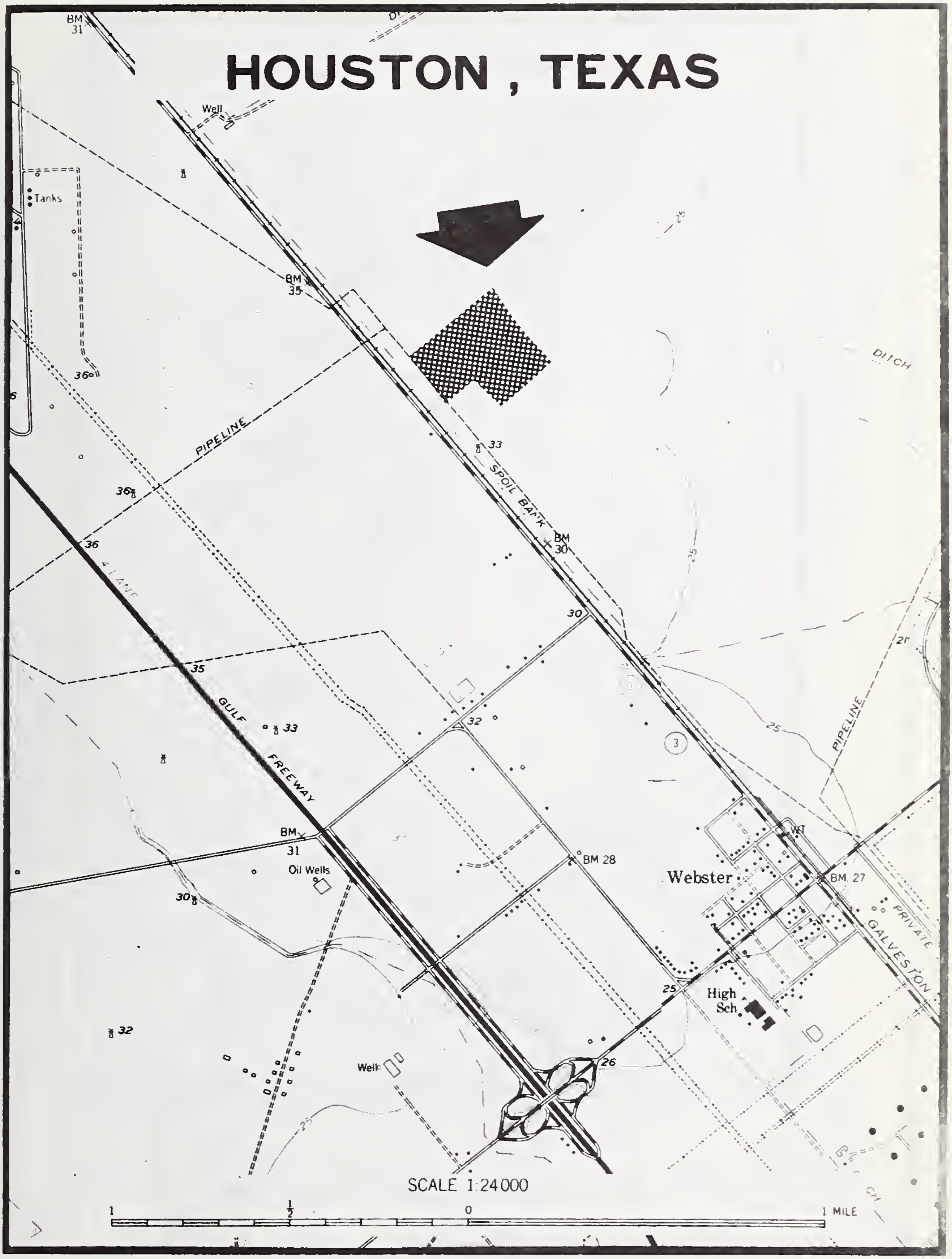
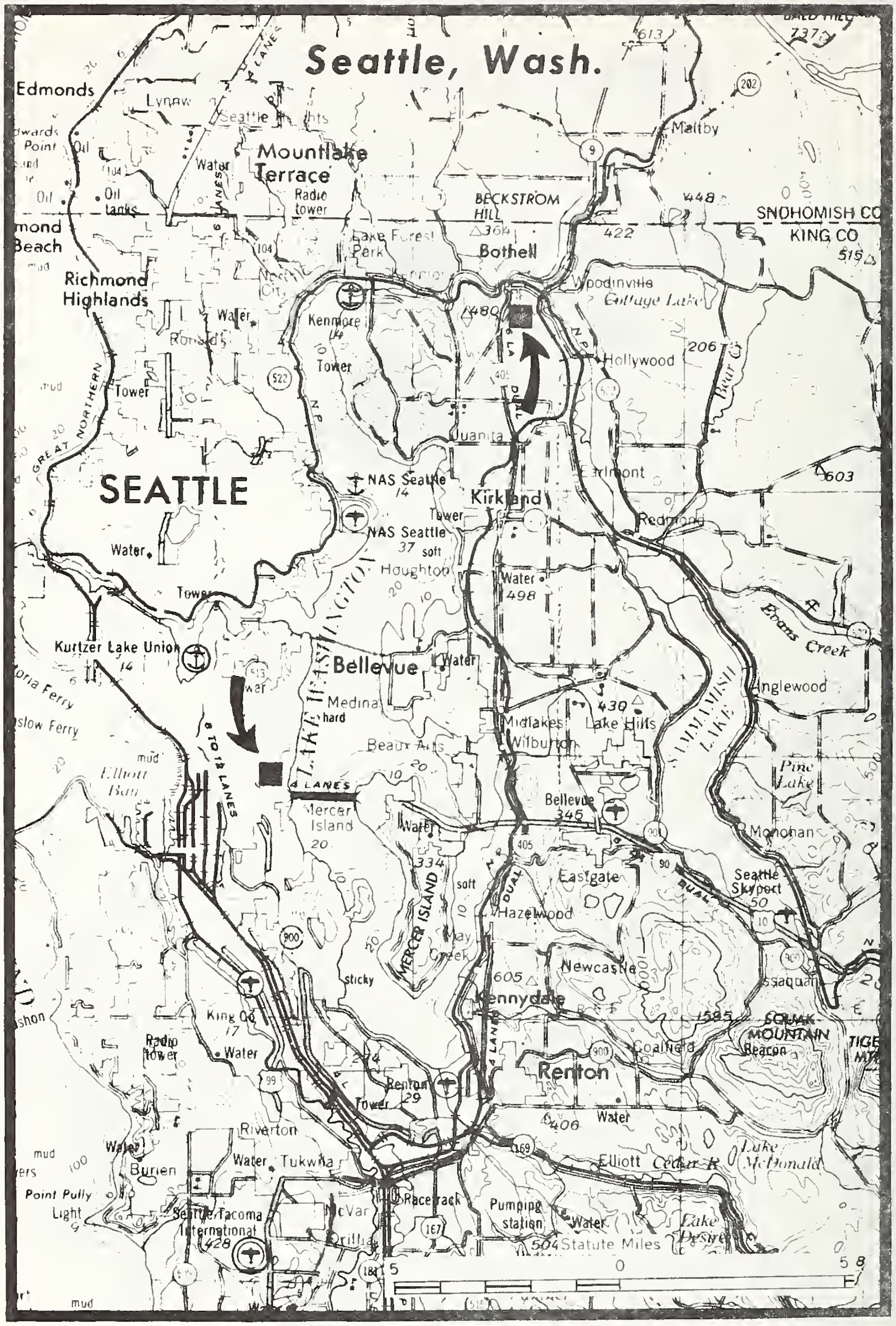
Oakville
Memphis
331
ST LOUIS SAN FRANCISCO
Underground pipeline
Capleville
BDY
INDEP


MEMPHIS, TENN.
MUD ISLAND
WOLF RIVER LAGOON
REVETMENT
Washington Park
North Yards
Caldwell Sch
Bickford Park
Grant Sch
Fire Sta
Community Center
Guthrie Sch
St Anthony Sch
Seventh Street Ch
CHELSEA
WELLS AVE
VOLLINTINE
Holy Name Sch
Gordon Sch
Keel Sch
Pumping Sta
BM 238
Maltine Park
Wesley Community Center
Humes Sch
Hosp
JACKSON
Fire Sta
Epworth Ch
Pope Sch
NORTH
Hospitals
LOUISVILLE
Pumping Sta
BM 254
Winchester Park
FORREST AND
Hospital
Carnes Sch
PROPOSED LOCATION
Ellis Auditorium
St Marys Sch
City Hall
Courthouse
BM 264
Park
POPLAR
Collins Chapel
MEMPHIS
Maury Sch
Moore Sch
Temple Israel
Joe Curtis Point
Light
PO
Library
Fire Sta
Chickasaw Bluff No 4
DRIVE
MADISON
JEFFERSON
Hospitals
VA Hospital
Fire Sta
Park
Hospitals
Sacred Heart Sch
UNION AVE
Lee Park
Handy Park
BEALE
Forrest Park
Univ of Tennessee Medical Center
Fire Sta
St Patricks Ch
Leath Sch
YMCA
LINDEN
EASTMORELAND
BM 294
Central High Sch
VANCE
Union Grove Ch
Fire Sta
Army Park
Navy Park
St Johns Ch
SOUTHERN
PEABODY
Owen College
Foote Homes Park
Locke Sch
BLVD
Bruce Sch
St Johns Ch
Porter Sch
Brown Park
Hospital
Bellevue Sch
GEORGIA
Georgia Avenue Sch
WELLINGTON
POLK AVE
LAMAR
40

HOUSTON , TEXAS




Seattle, Wash.
Edmonds
Lynnw
Seattle Heights
Mountlake Terrace
Radio tower
Water
Oil
Oil tanks
Richmond Highlands
Ronalds
Tower
GREAT NORTHERN
SEATTLE
Water
Tower
Kurtzer Lake Union
14
Elliott Bay
mud
6 TO 12 LANES
4 LANES
Maltby
BECKSTROM HILL
364
Bothell
SNOHOMISH CO
KING CO
515
448
422
Lake Forest Park
North City
Kenmore
14
Tower
Woodinville
Cottage Lake
1480
Hollywood
206
Bear C
Juanita
NAS Seattle
14
Tower
NAS Seattle
37
soft
Houghton
Kirkland
Fairmont
Redmond
603
Water
498
Evans Creek
Bellevue
Water
Medina
hard
LAKE WASHINGTON
Inglewood
430
Lake Hills
Midlakes
Wilburton
SAMMAMISH LAKE
Beaux Arts
Pine Lake
Mercer Island
20
Water
Bellevue
345
Monohan
Eastgate
Seattle Skyport
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MERCER ISLAND
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Hazelwood
May Creek
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Newcastle
Issaquah
Kennydale
1595
SQUAK MOUNTAIN
Beacon
sticky
King Co
17
Water
Radio tower
Renton
29
Tower
Renton
Coalfield
Water
406
Riverton
Water
Tukwila
Burien
Point Pully Light
mud
Seattle/Tacoma International
428
McVar
Orillia
Racetrack
Pumping station
Water
504
Elliott
Cedar R
Lake McDonald
Lake Desire
Statute Miles
5
0
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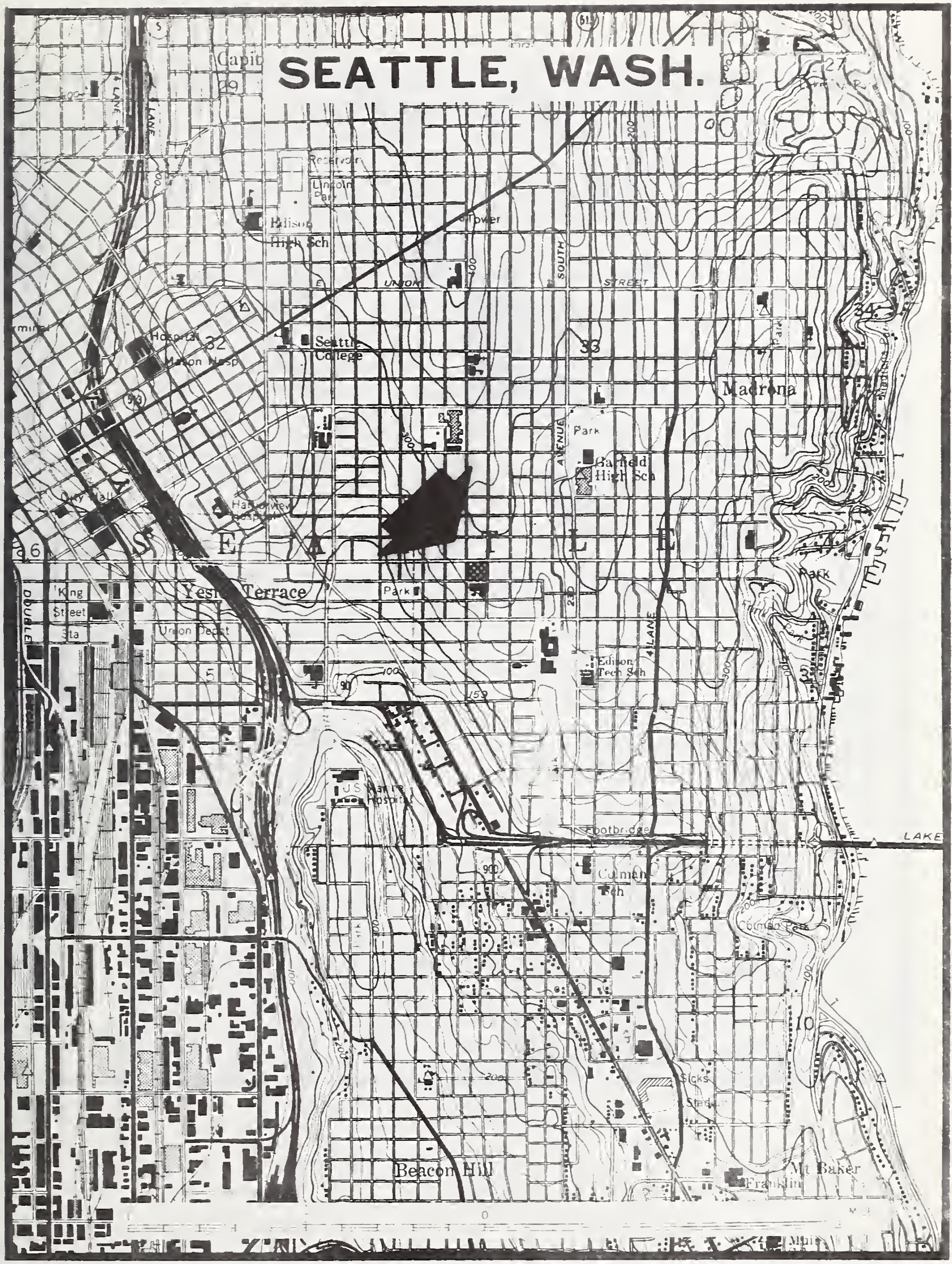
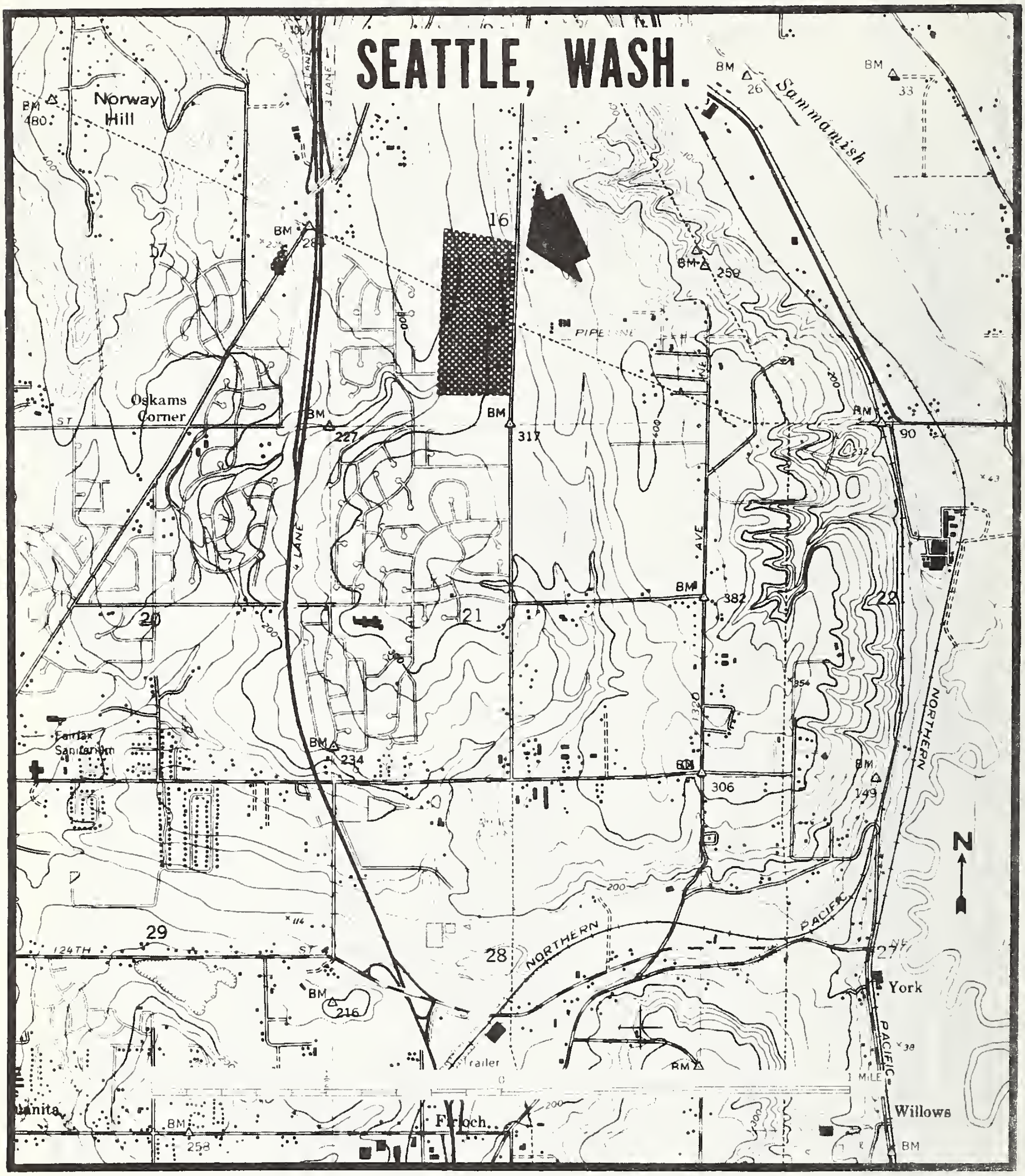
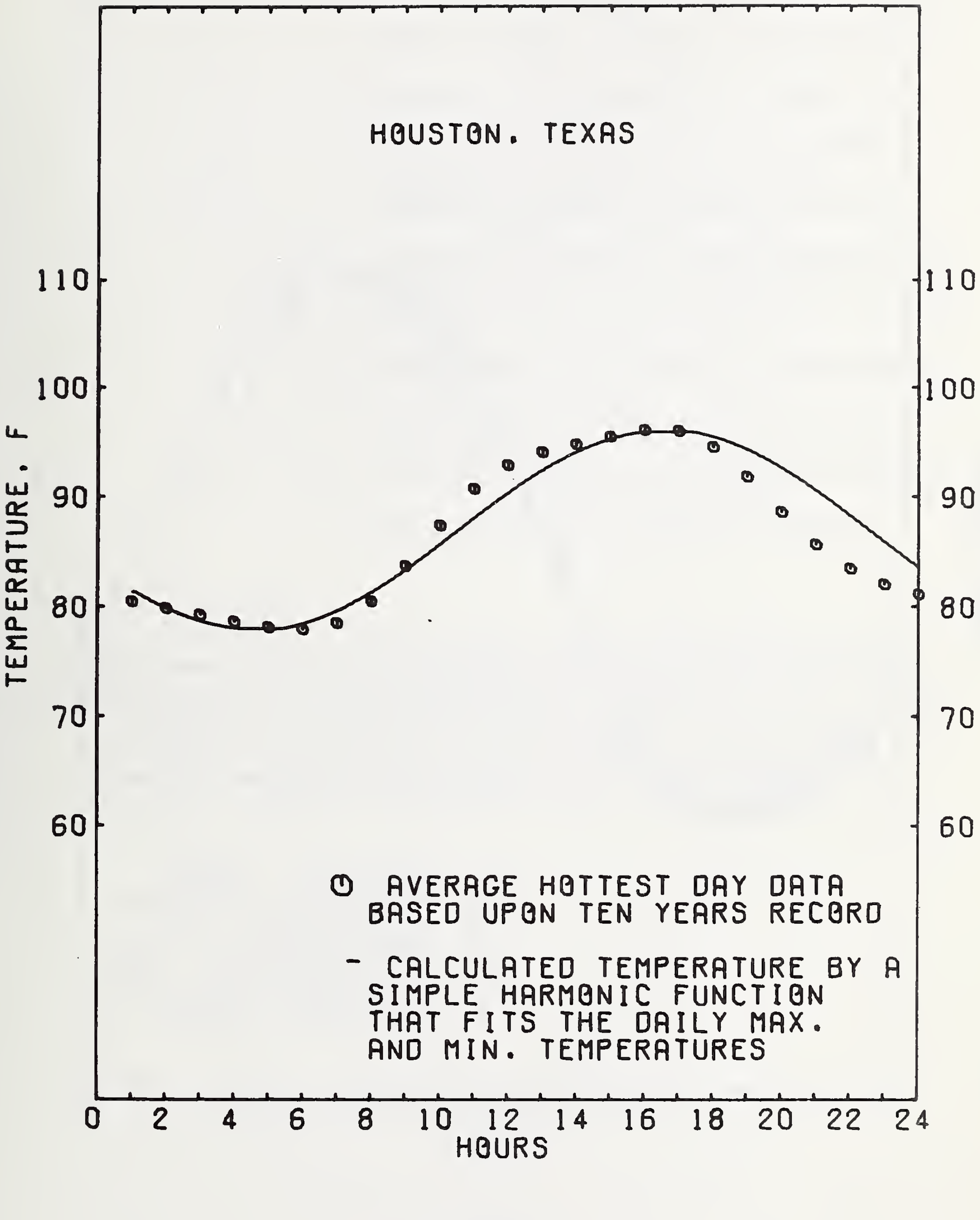

SEATTLE, WASH.
Capitol
29
27
Reservoir
Lincoln Park
Edison High Sch
Tower
E UNION
SOUTH
STREET
Seattle College
Hospital
Marion Hosp
32
33
34
Madrona
Park
AVENUE
Garfield High Sch
Harborview Hosp
City Hall
S E A T T L E
Yesler Terrace
King Street Sta
Union Depot
DOUBLE LANE
4 LANE
5
Park
Edison Tech Sch
U S Marine Hospital
Footbridge
LAKE
Colman Sch
Colman Park
10
Sicks Stadium
Beacon Hill
Mt Baker
Franklin

SEATTLE, WASH.





HOUSTON, TEXAS
TEMPERATURE, F
110
100
90
80
70
60
0
2
4
6
8
10
12
14
16
18
20
22
24
HOURS
AVERAGE HOTTEST DAY DATA BASED UPON TEN YEARS RECORD
CALCULATED TEMPERATURE BY A SIMPLE HARMONIC FUNCTION THAT FITS THE DAILY MAX. AND MIN. TEMPERATURES

Figure 1

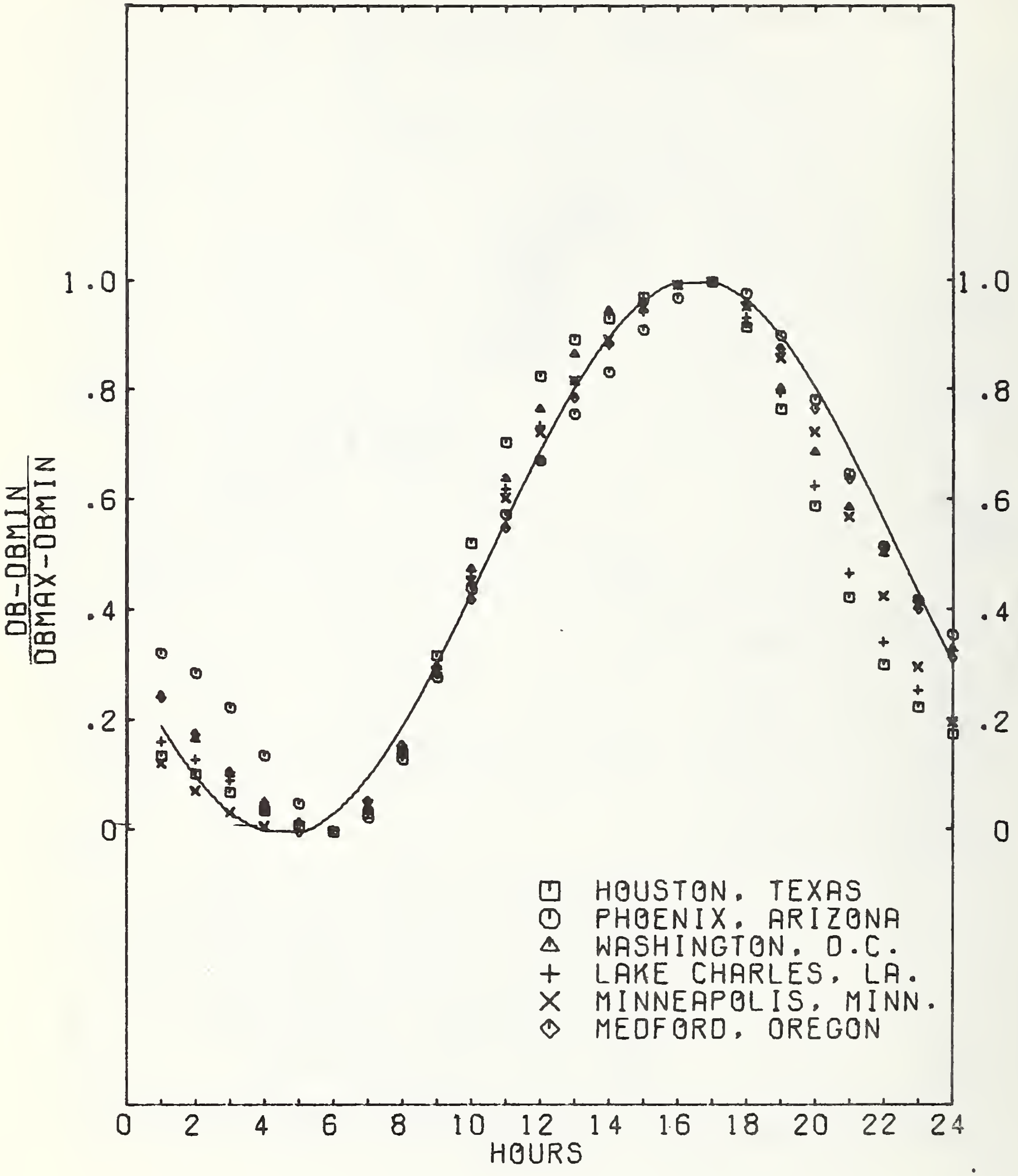

1.0
.8
.6
.4
.2
0
DB-DBMIN / DBMAX-DBMIN
0 2 4 6 8 10 12 14 16 18 20 22 24
HOURS
□ HOUSTON, TEXAS
○ PHOENIX, ARIZONA
△ WASHINGTON, D.C.
+ LAKE CHARLES, LA.
× MINNEAPOLIS, MINN.
◇ MEDFORD, OREGON

Figure 2

Figures 3 through 22 - Coincident annual frequency profiles for the hourly dry-bulb temperature and wind speed, and those for this relative humidity and wind speed. The height of the profile represents relative frequency of the coincident occurrences[*/] based upon ten year average. All ten localities show the highest frequency profile at the wind speed in the vicinity of 5 mph. But the coincident dry-bulb temperature and relative humidity widely vary from locality to locality.

[*/] The approximate value of frequency for these three dimensional profiles may be determined by noting in Figure 3 that it's peak represents 750 hourly observations while in Figure 4 that it is 2200 hourly observations. The scales for all the other profiles for temperature/wind speed and relative humidity/wind speed are consistent with Figures 3 and 4, respectively.

SACRAMENTO, CALIFORNIA

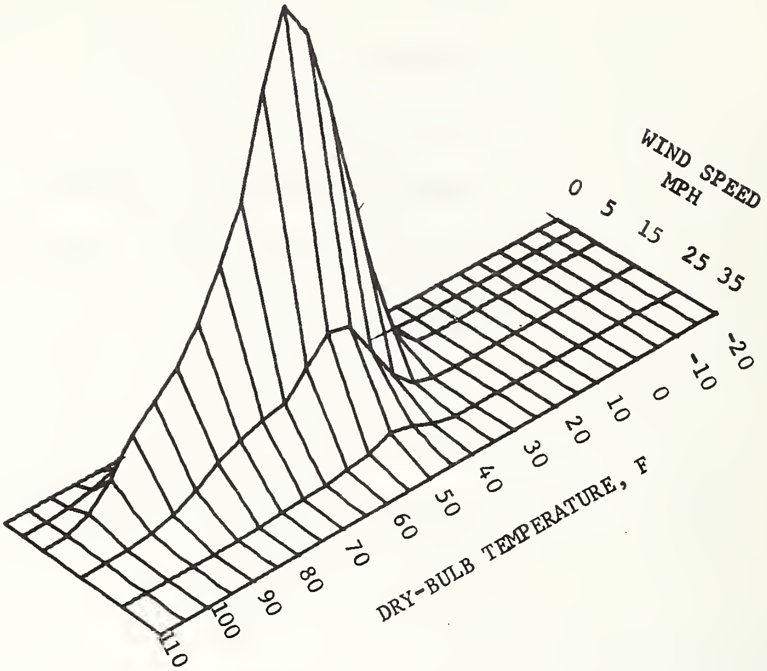


Fig. 3 COINCIDENT PROFILE FOR WIND SPEED AND DRY BULB TEMPERATURE

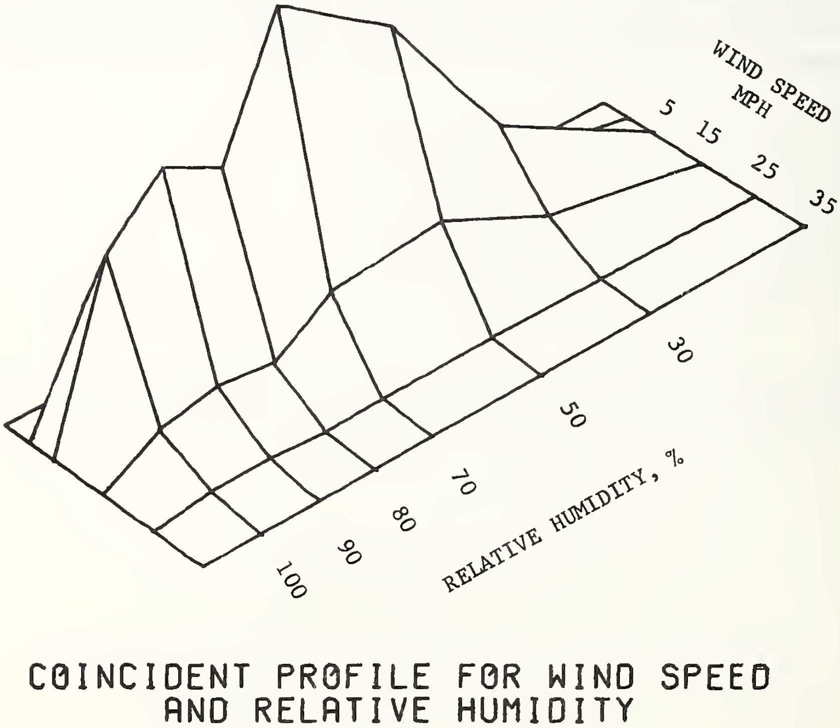


Fig. 4 COINCIDENT PROFILE FOR WIND SPEED AND RELATIVE HUMIDITY

WILMINGTON, DELAWARE

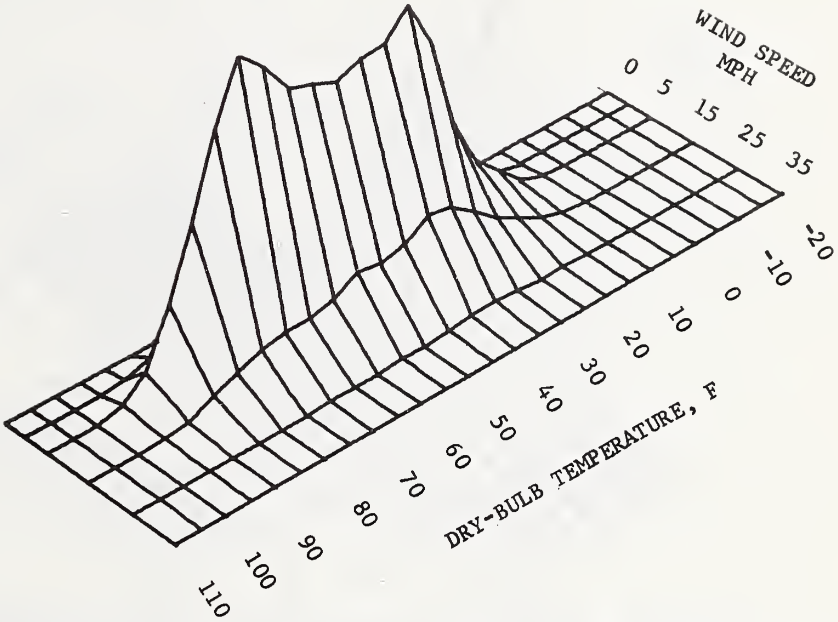


Fig. 5. COINCIDENT PROFILE FOR WIND SPEED AND DRY BULB TEMPERATURE

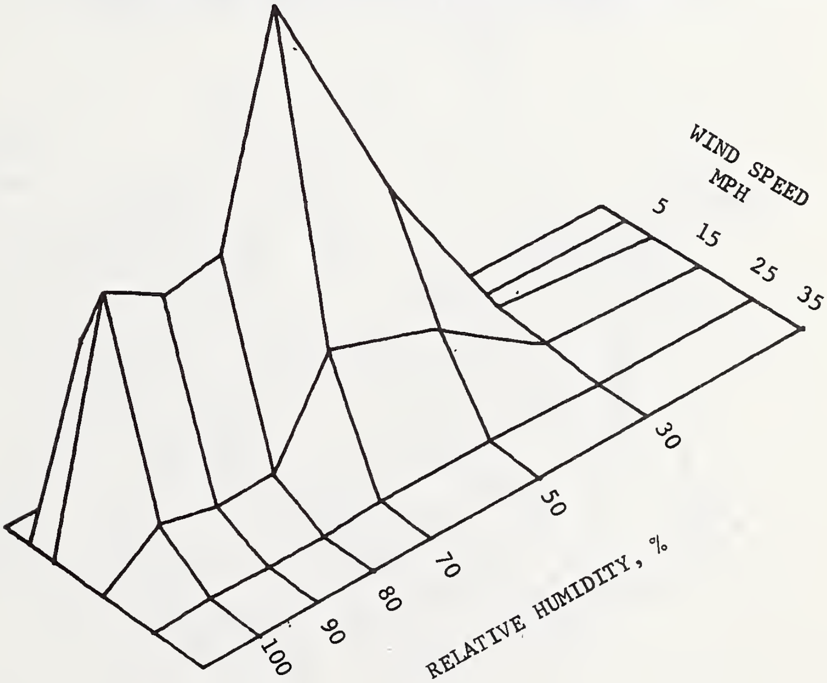


Fig. 6 COINCIDENT PROFILE FOR WIND SPEED AND RELATIVE HUMIDITY

MACON, GEORGIA

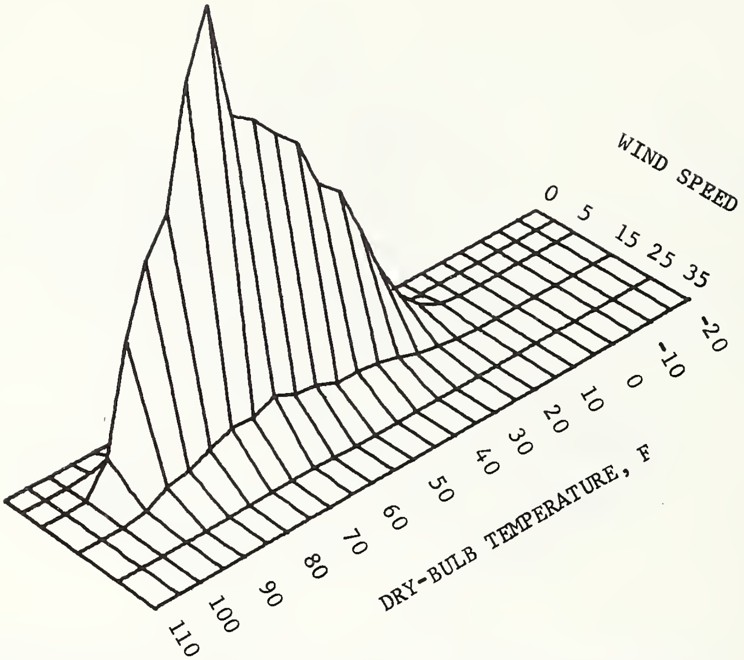


Fig. 7 COINCIDENT PROFILE FOR WIND SPEED AND DRY BULB TEMPERATURE

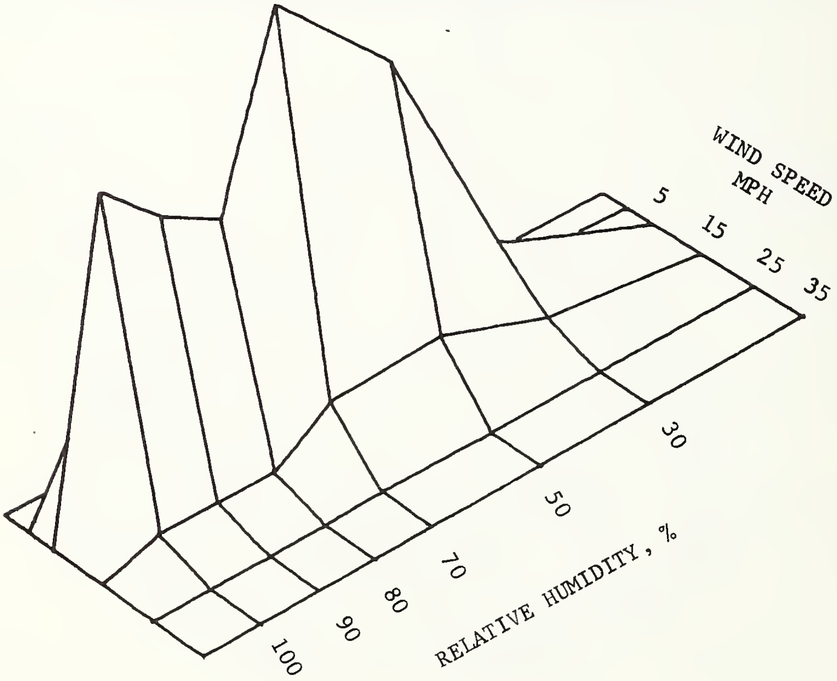


Fig. 8 COINCIDENT PROFILE FOR WIND SPEED AND RELATIVE HUMIDITY

INDIANAPOLIS, INDIANA

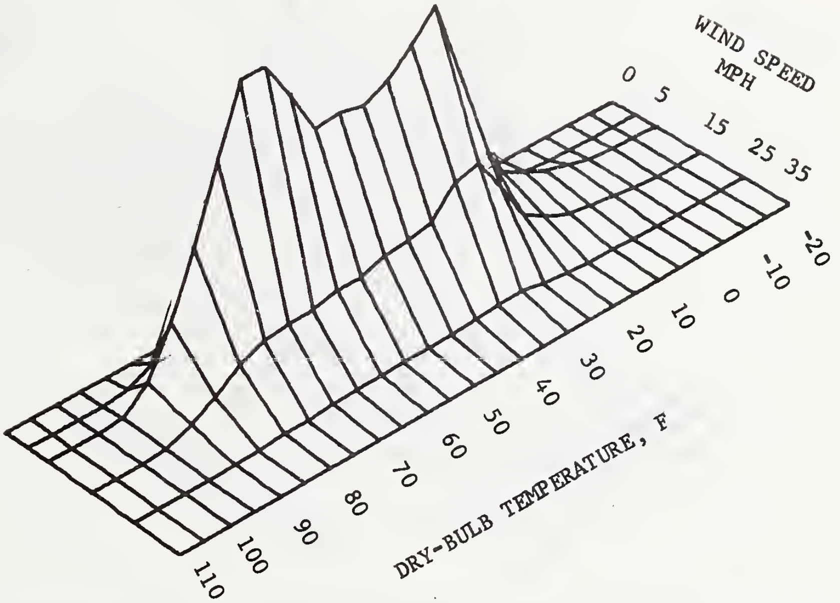


Fig. 9 COINCIDENT PROFILE FOR WIND SPEED AND DRY BULB TEMPERATURE

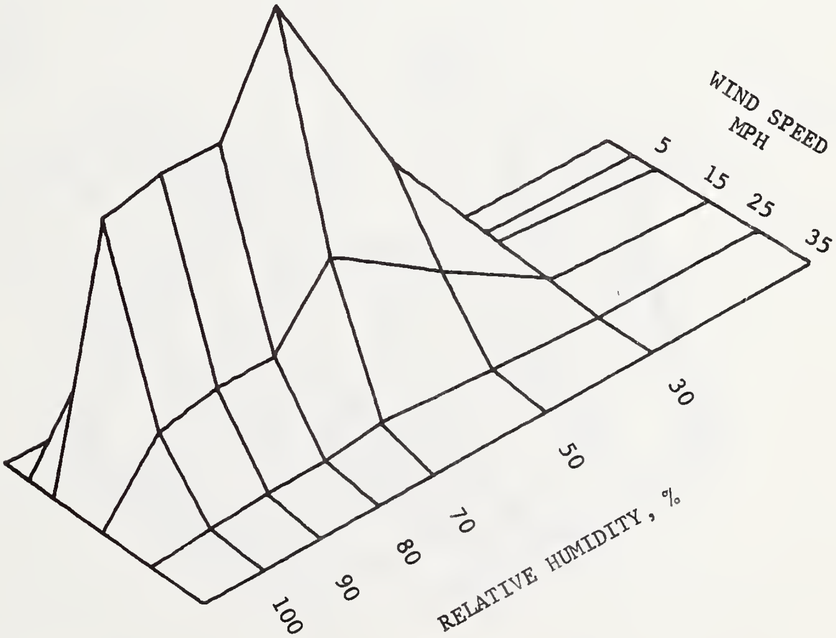


Fig. 10 COINCIDENT PROFILE FOR WIND SPEED AND RELATIVE HUMIDITY

GRAND RAPIDS, MICHIGAN

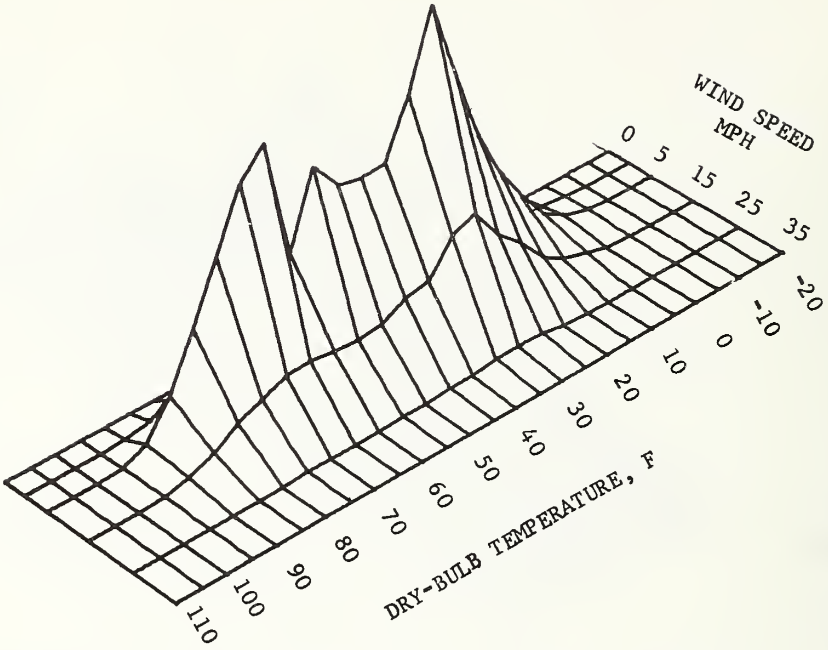


Fig. 11 COINCIDENT PROFILE FOR WIND SPEED AND DRY BULB TEMPERATURE

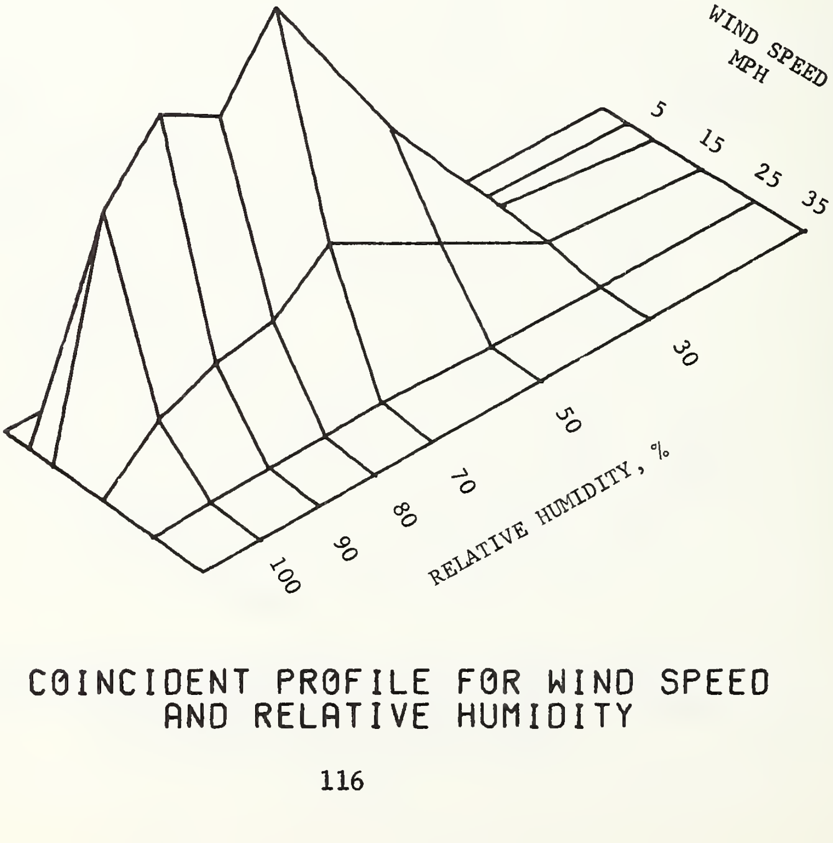


Fig. 12 COINCIDENT PROFILE FOR WIND SPEED AND RELATIVE HUMIDITY

NEWARK, NEW JERSEY

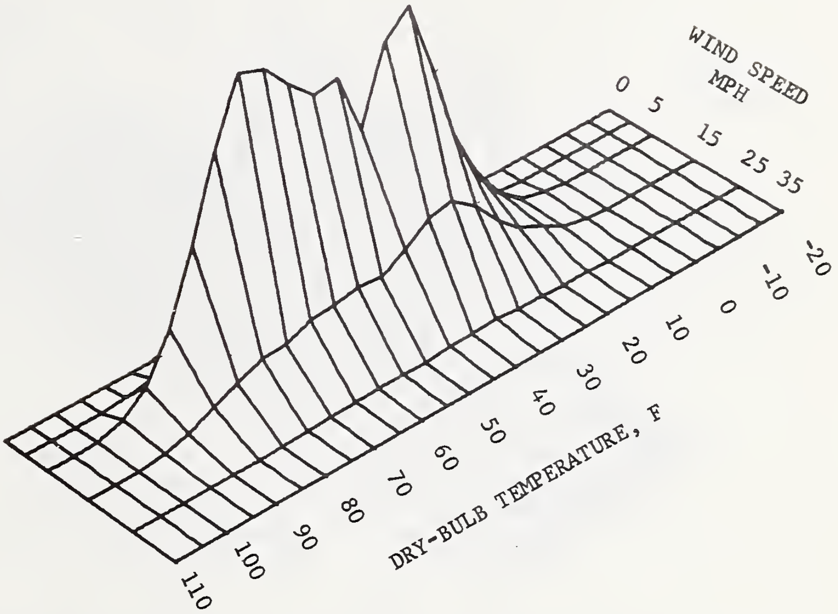


Fig. 13 COINCIDENT PROFILE FOR WIND SPEED AND DRY BULB TEMPERATURE

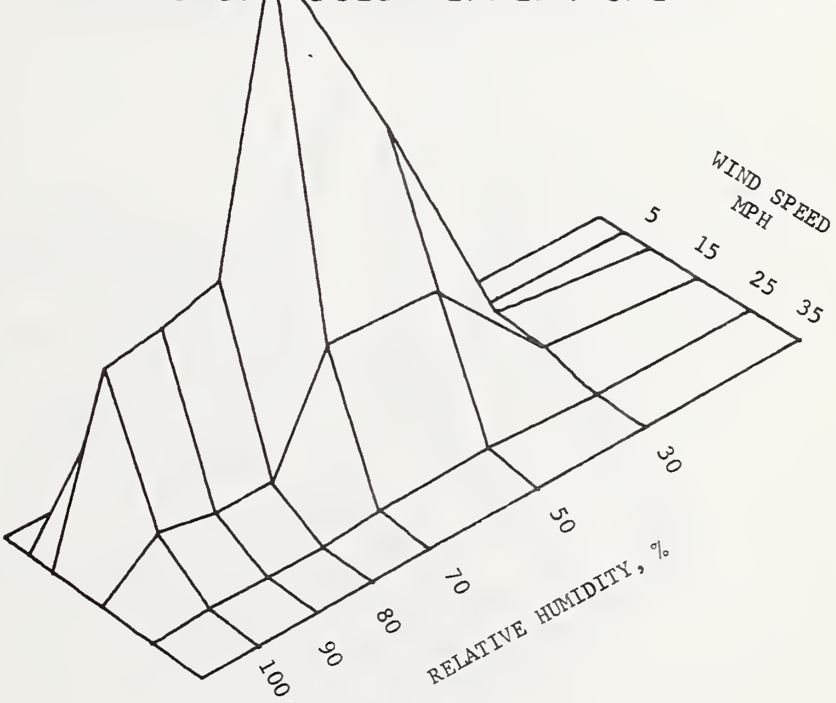


Fig. 14 COINCIDENT PROFILE FOR WIND SPEED AND RELATIVE HUMIDITY

ST. LOUIS, MISSOURI

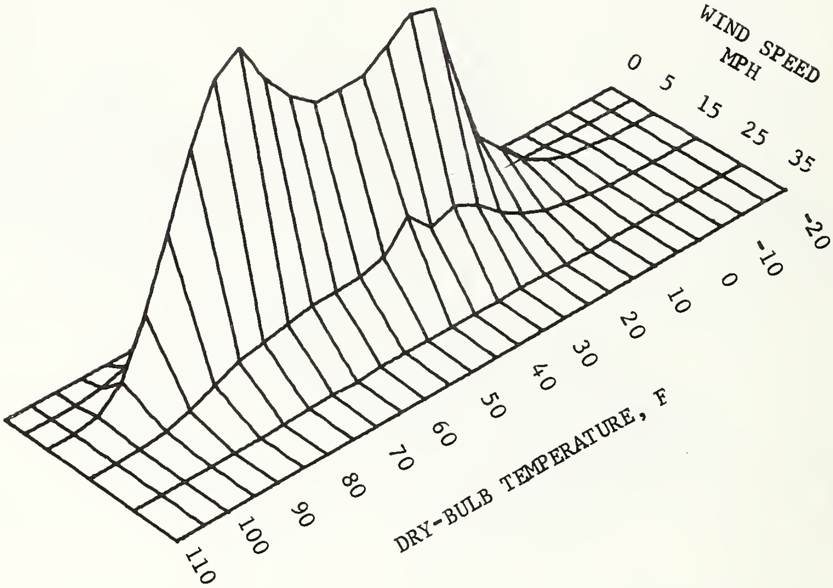


Fig. 15 COINCIDENT PROFILE FOR WIND SPEED AND DRY BULB TEMPERATURE

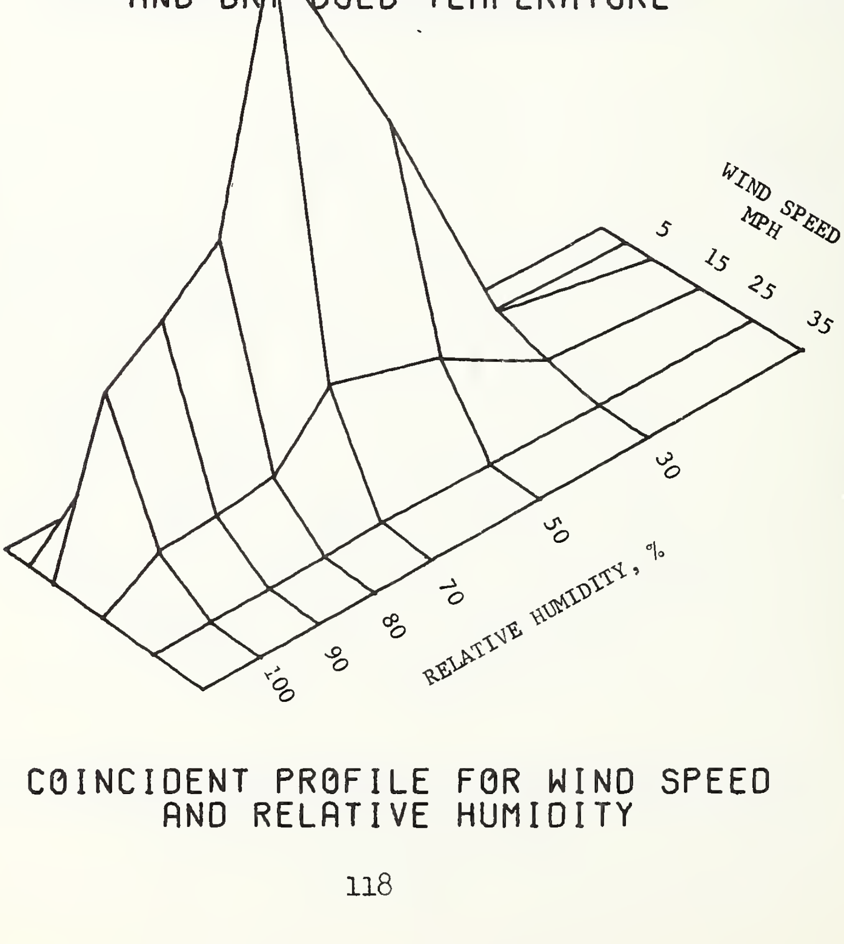


Fig. 16 COINCIDENT PROFILE FOR WIND SPEED AND RELATIVE HUMIDITY

MEMPHIS, TENNESSEE

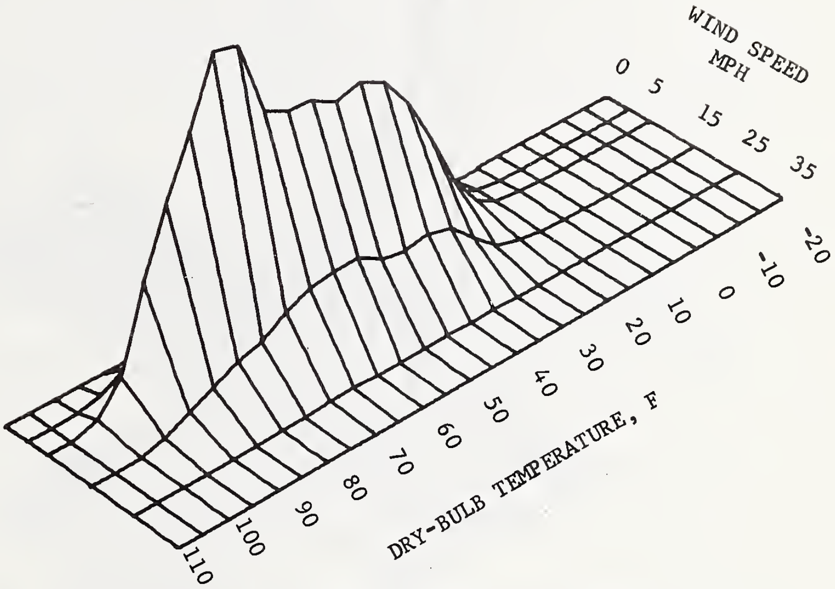


Fig. 17 COINCIDENT PROFILE FOR WIND SPEED AND DRY BULB TEMPERATURE

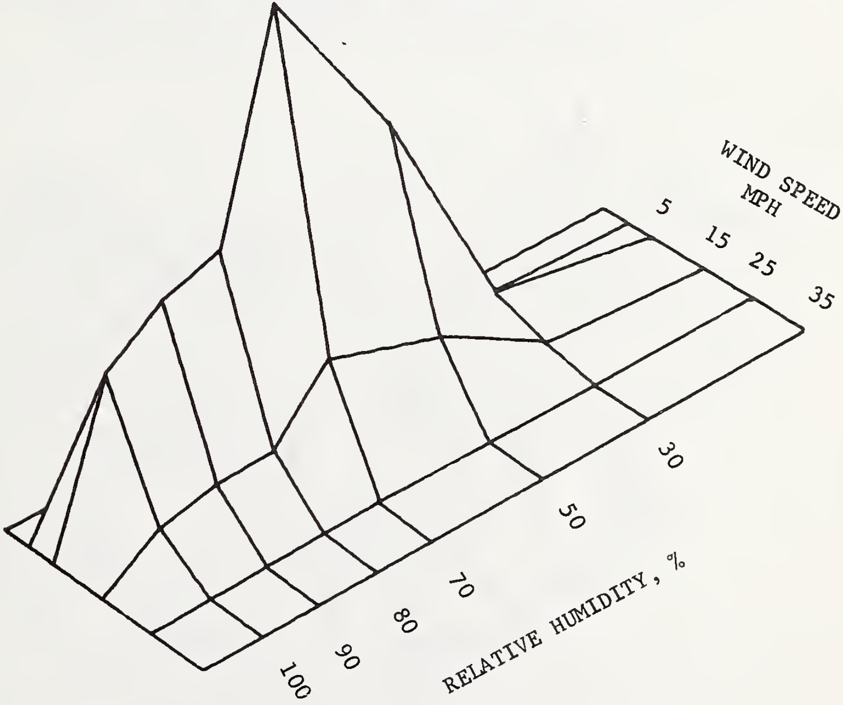


Fig. 18 COINCIDENT PROFILE FOR WIND SPEED AND RELATIVE HUMIDITY

HOUSTON, TEXAS

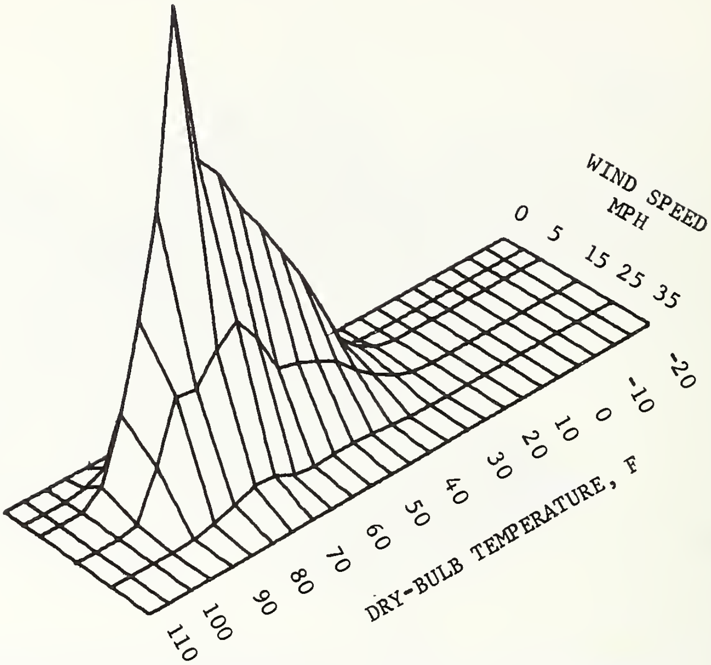


Fig. 19 COINCIDENT PROFILE FOR WIND SPEED AND DRY BULB TEMPERATURE

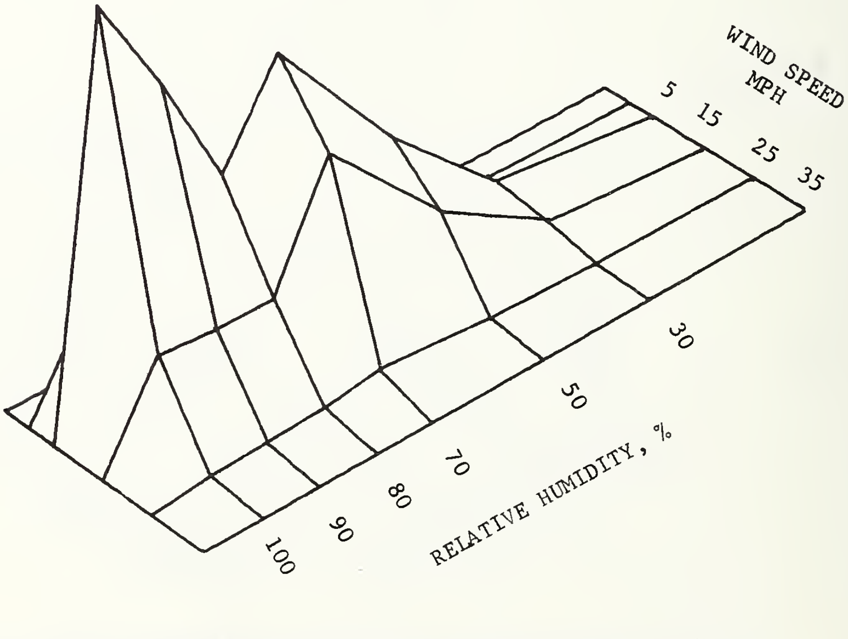


Fig. 20 COINCIDENT PROFILE FOR WIND SPEED AND RELATIVE HUMIDITY

SEATTLE, WASHINGTON

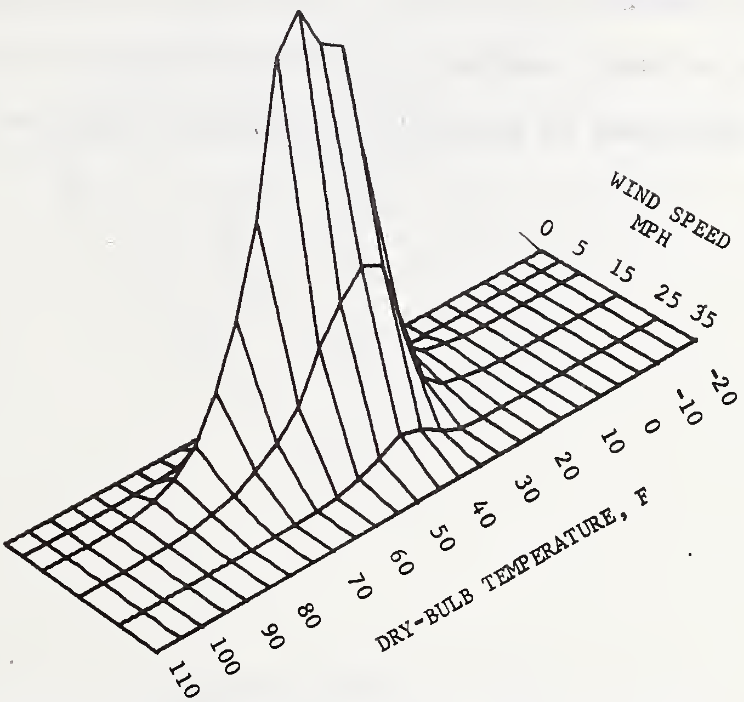


Fig. 21 COINCIDENT PROFILE FOR WIND SPEED AND DRY BULB TEMPERATURE

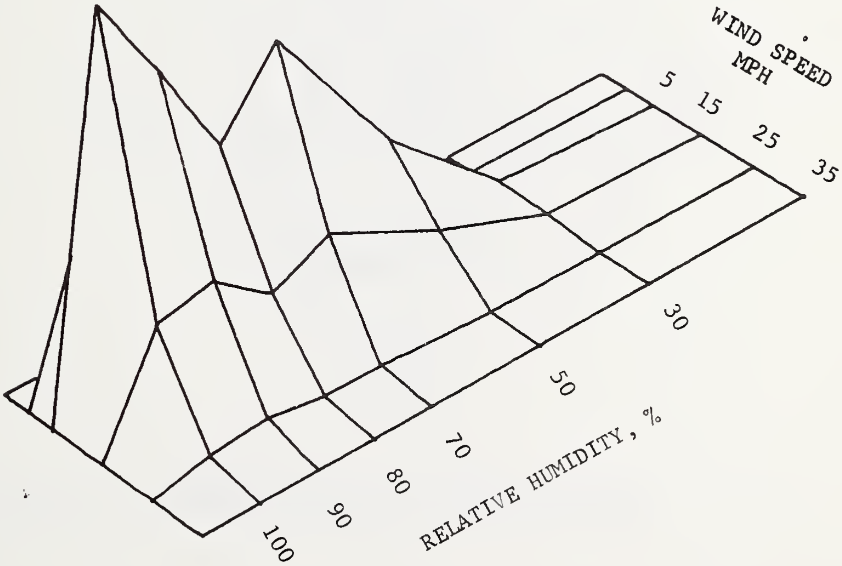
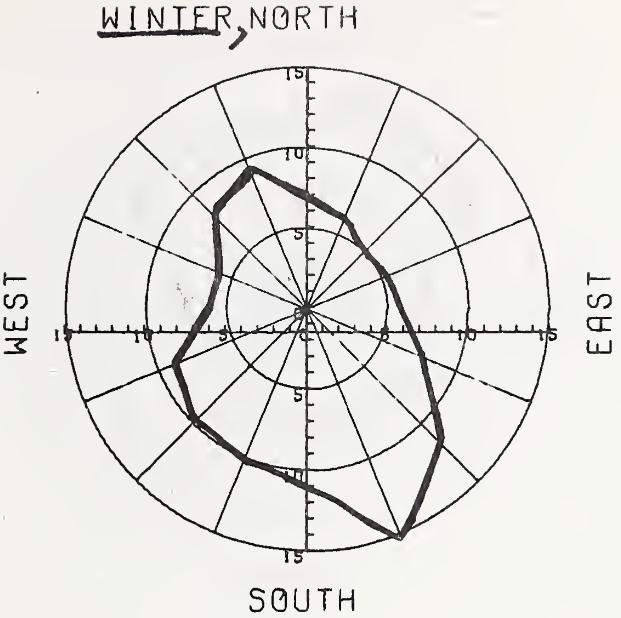
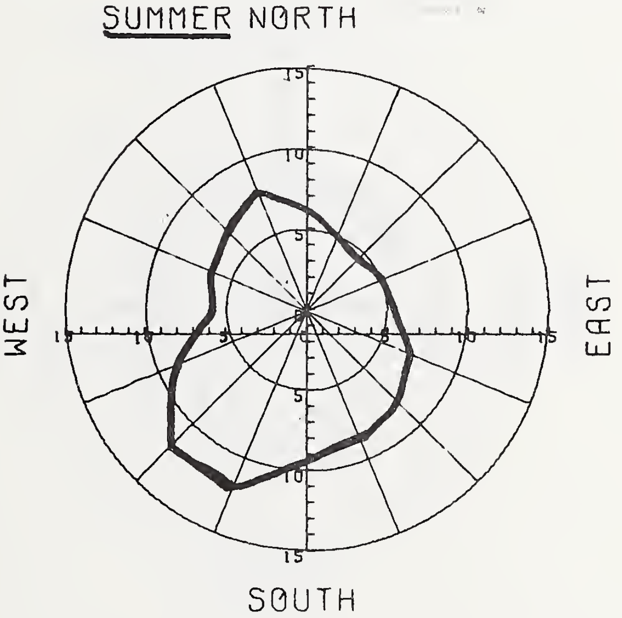


Fig. 22 COINCIDENT PROFILE FOR WIND SPEED AND RELATIVE HUMIDITY

Figures 23 through 32 present wind flow patterns by plotting the annual average wind speed in a polar form with respect to the direction of wind. Indicated on the polar diagram of the wind speed are the directions of prevailing wind during summer and winter seasons.

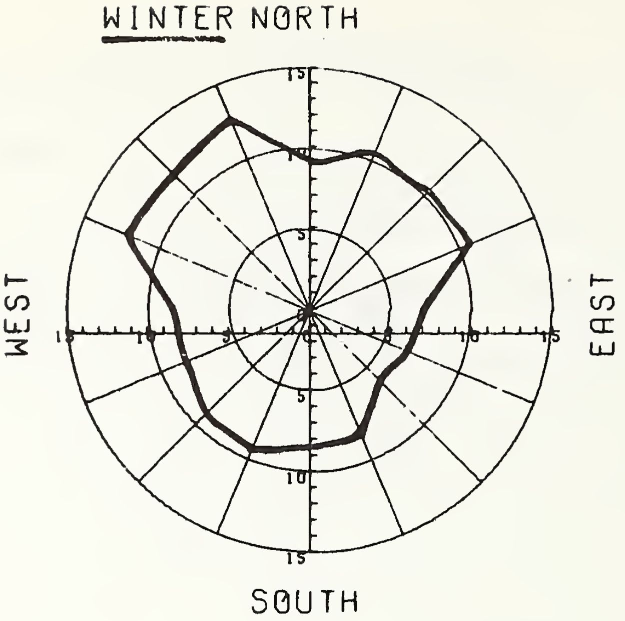


WINTER



SUMMER

Fig. 23 SACRAMENTO, CALIFORNIA



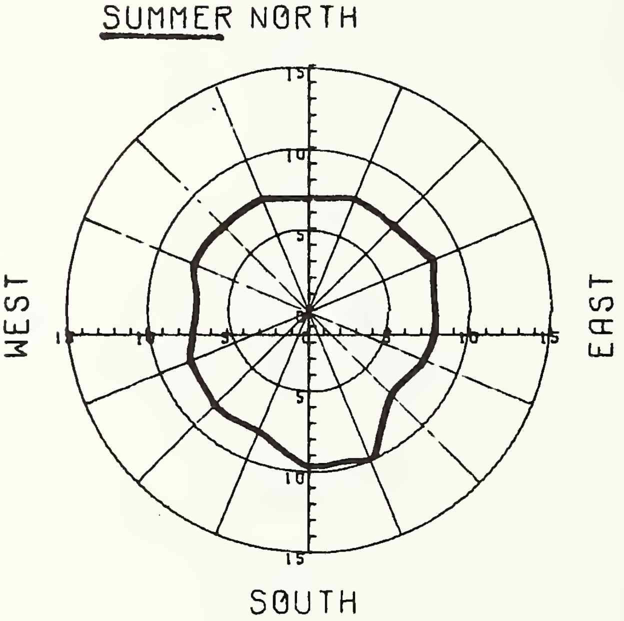


Fig. 24 WILMINGTON, DELAWARE

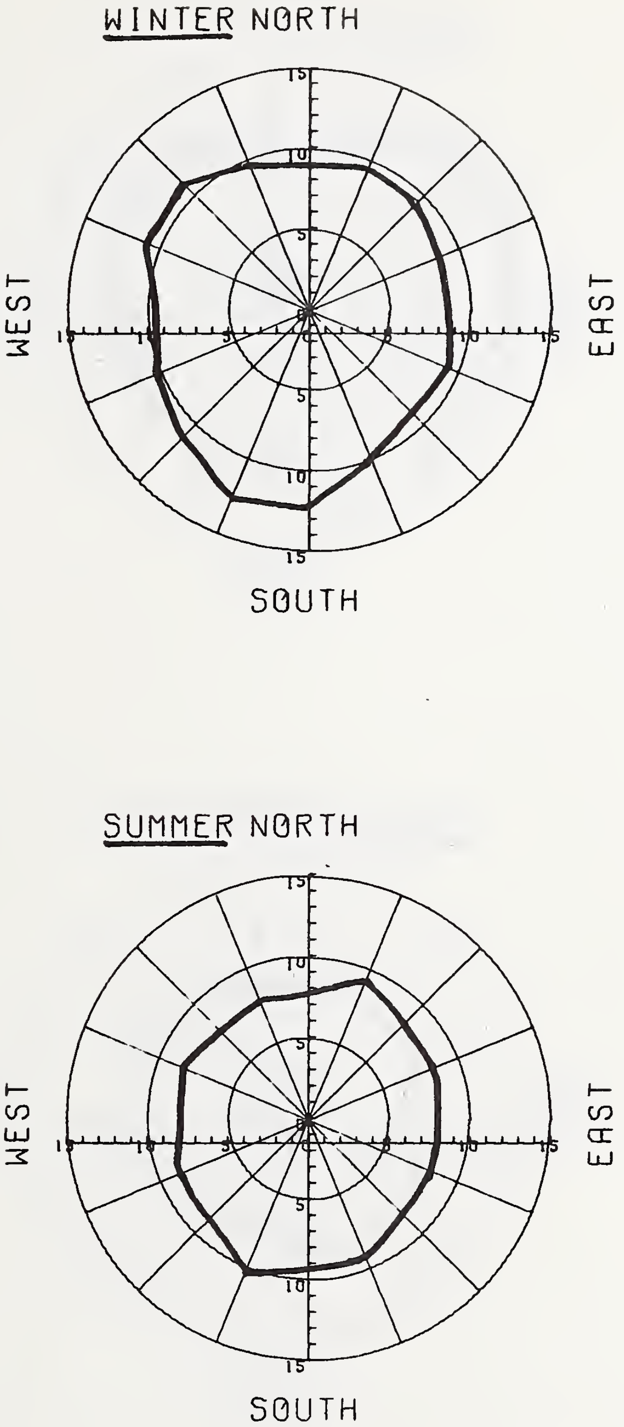


Fig. 25 MACON, GEORGIA

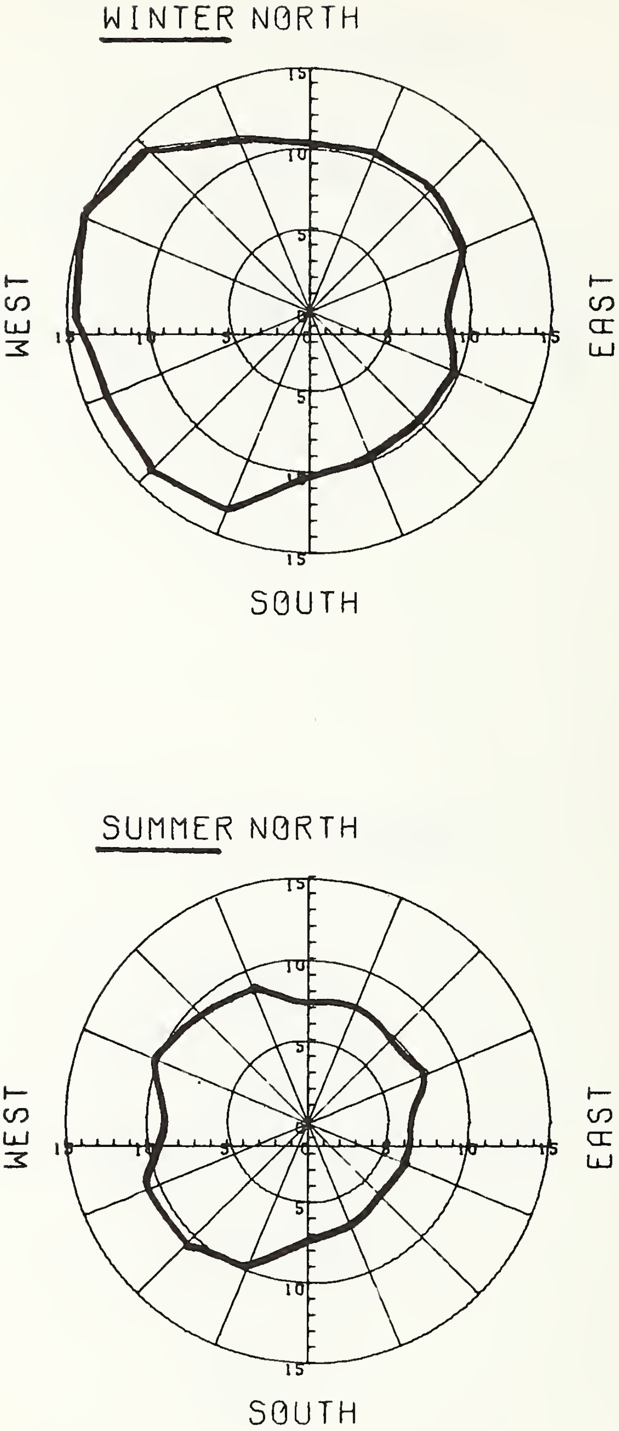


Fig. 26 INDIANAPOLIS, INDIANA

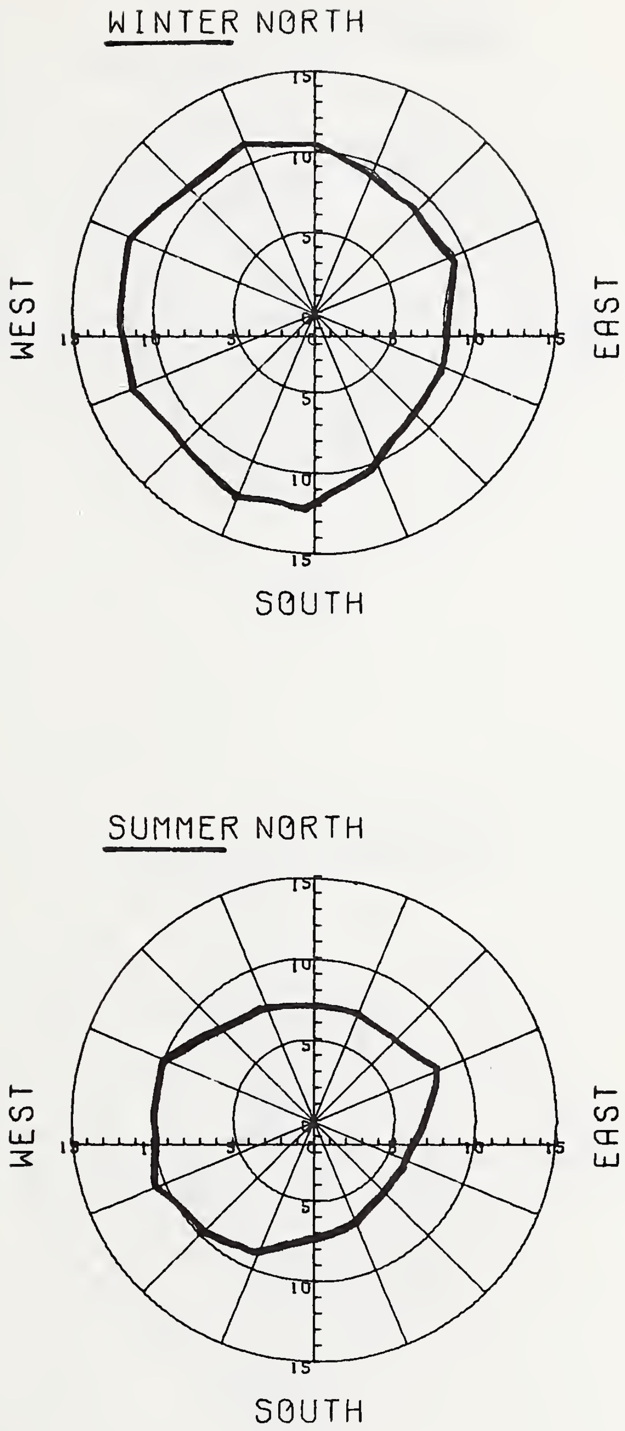
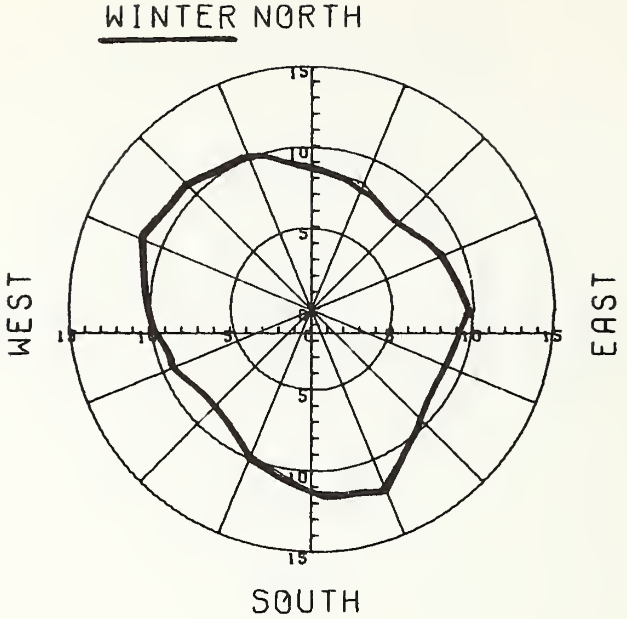


Fig. 27 GRAND RAPIDS, MICHIGAN

WINTER



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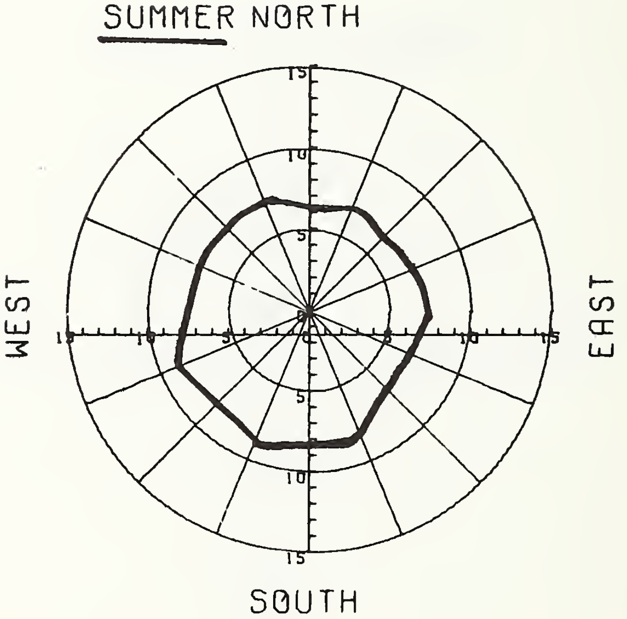


Fig. 28 ST. LOUIS, MISSOURI

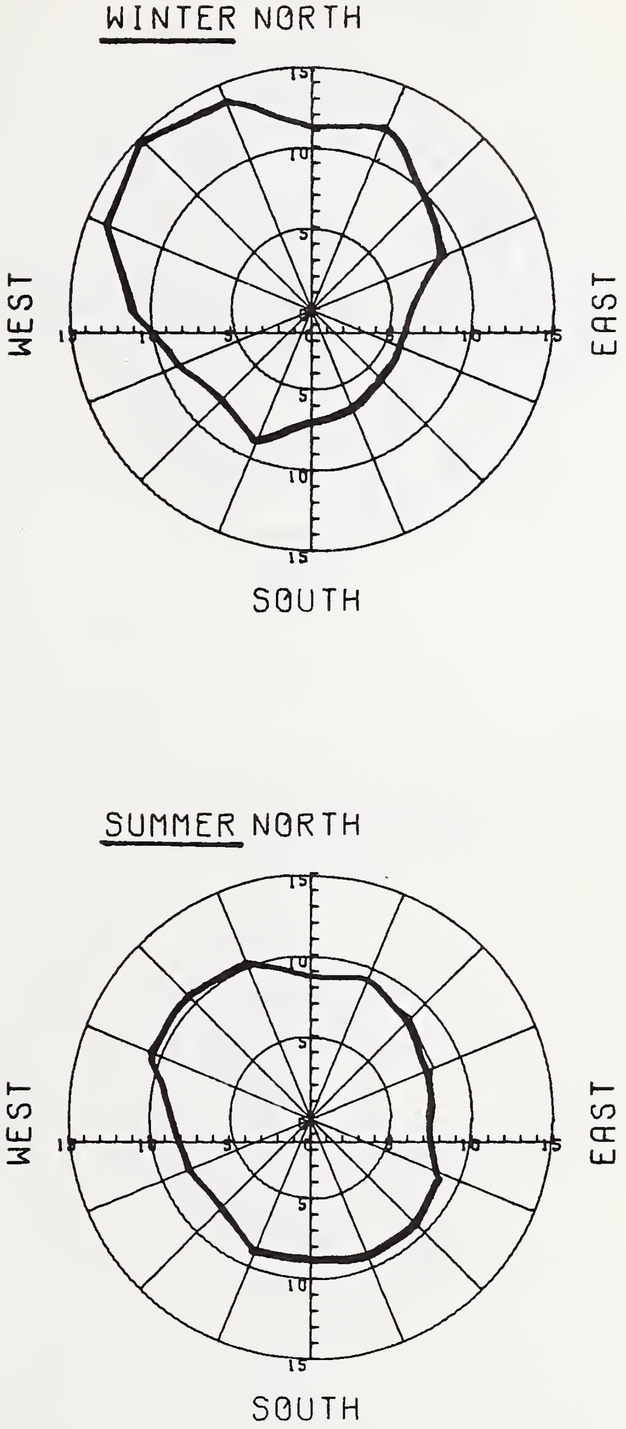
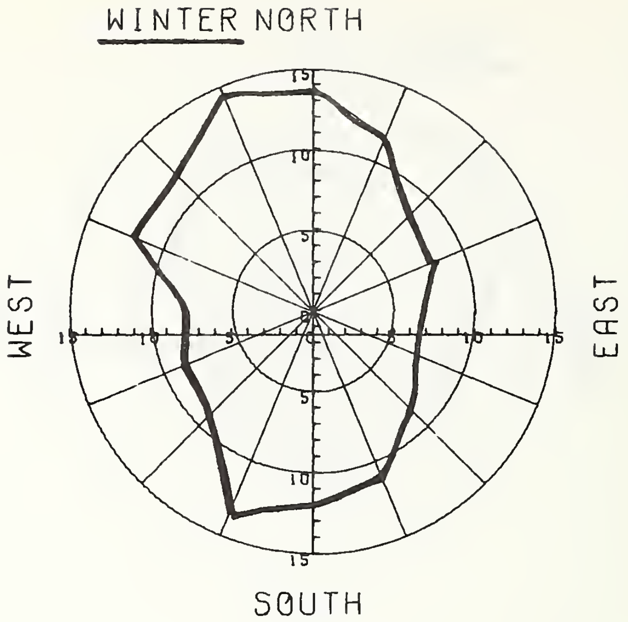


Fig. 29 NEWARK, NEW JERSEY



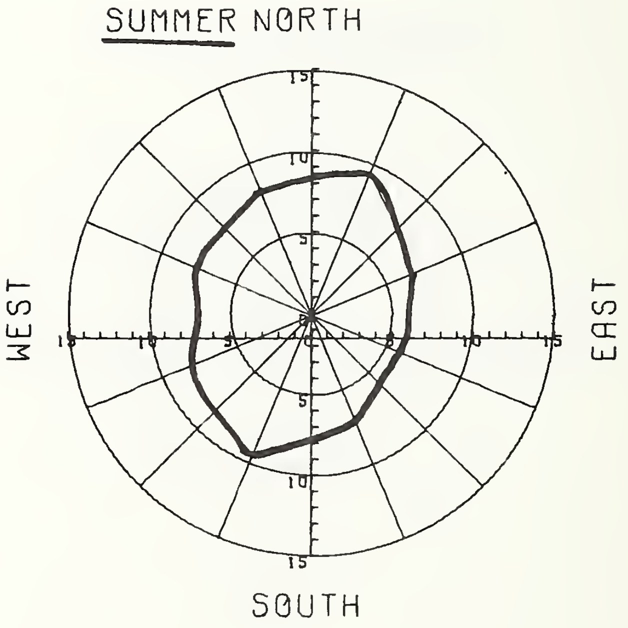


Fig. 30 MEMPHIS, TENNESSEE

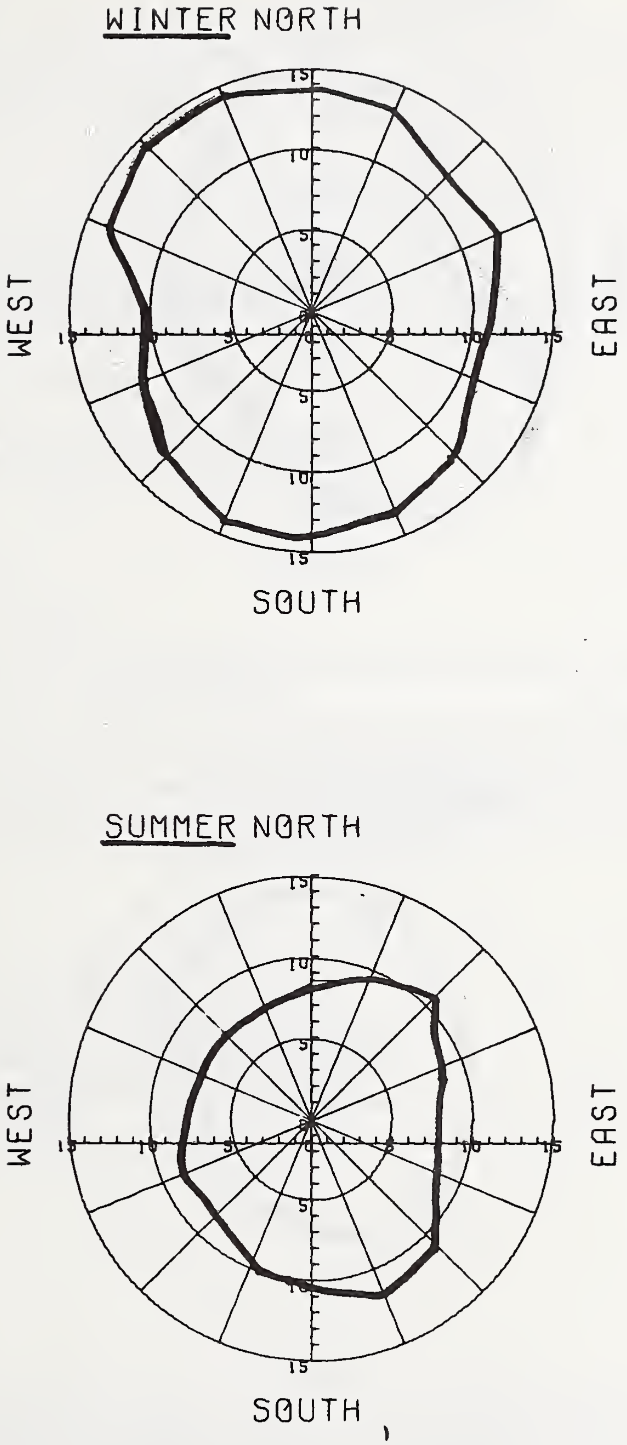
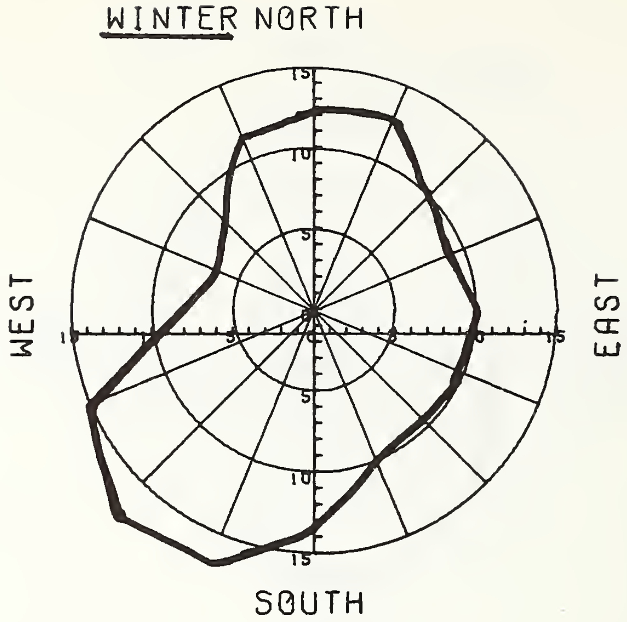


Fig. 31 HOUSTON, TEXAS



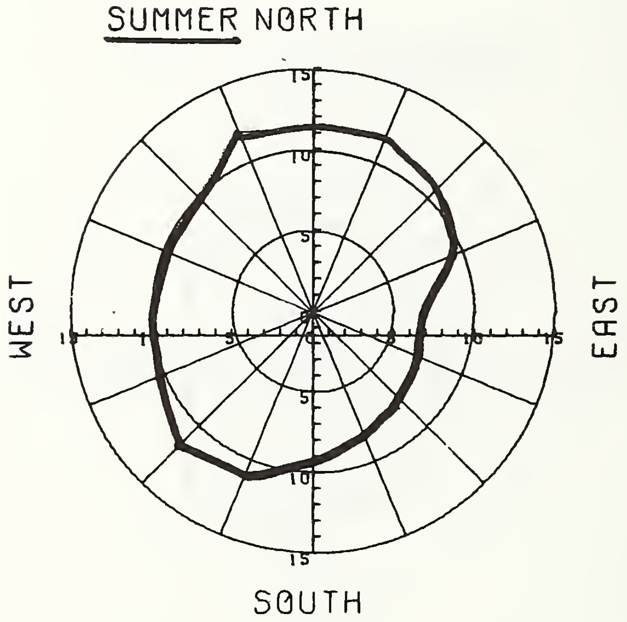


Fig. 32 SEATTLE, WASHINGTON

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16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

The purpose of this report is to provide preliminary information on site climatology useful for the design and evaluation of HUD Operation BREAKTHROUGH experimental building systems. In order to evaluate the design as well as the performance of building systems, the following environmental parameters are considered essential and are included in this report for each of the selected sites.

- Temperature
- Humidity
- Wind speed and direction
- Precipitation (snow and rain)
- Solar radiation (direct and diffuse)
- Ground temperature (depth and frost)
- Background noise level
- Air contamination
- Earthquake risk

17. KEY WORDS (Alphabetical order, separated by semicolons) Air contamination; design conditions; earthquake risk; evaluation; ground temperature; humidity; noise level; Operation BREAKTHROUGH; precipitation; solar radiation; temperature; wind direction; wind speed

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